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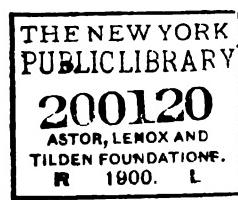
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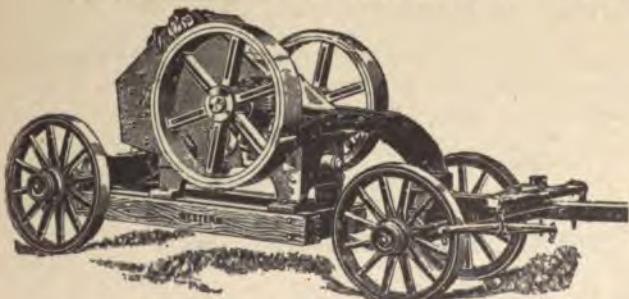
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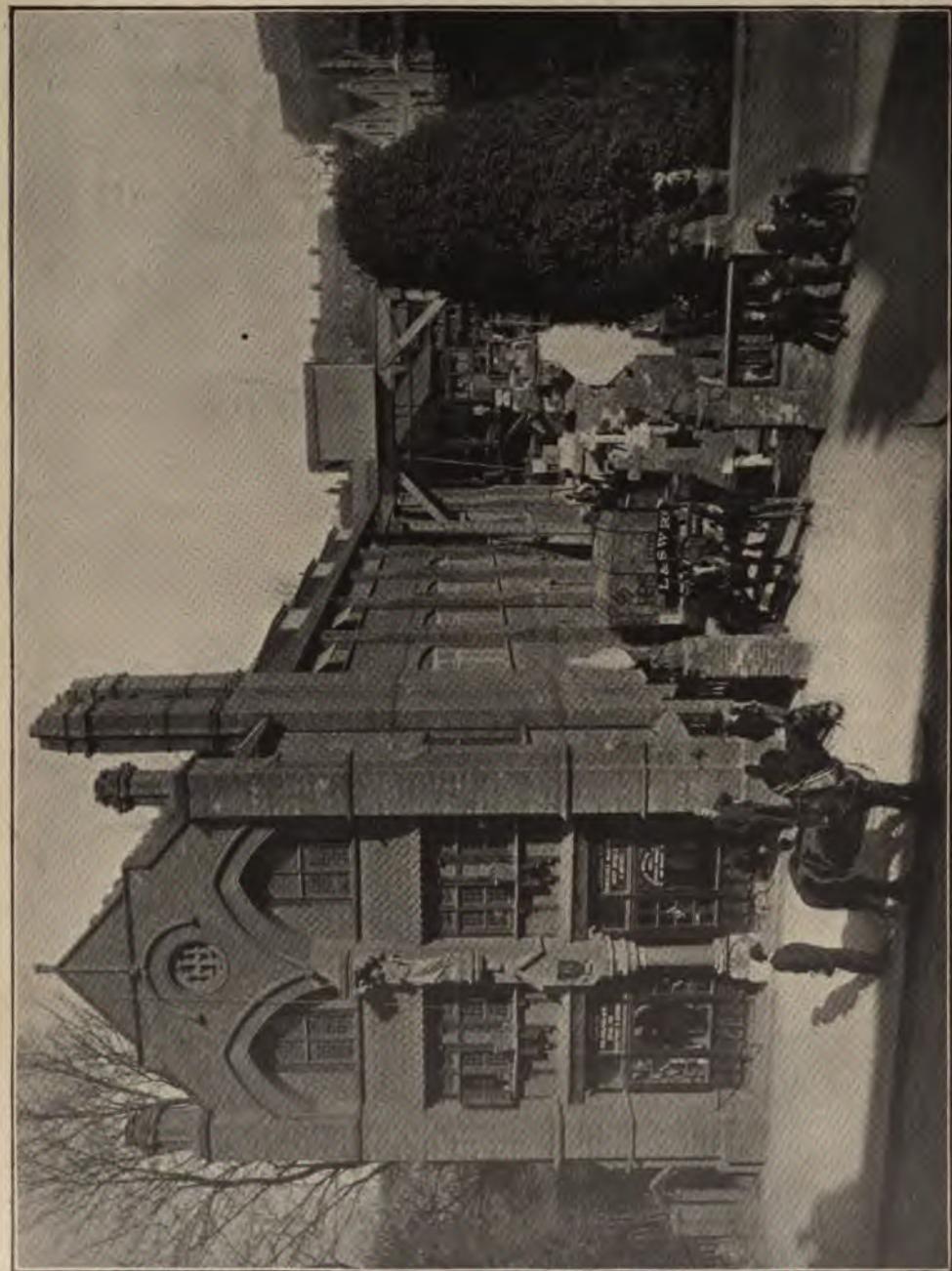
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VOLUME XIX.

JUNE.

NUMBER 1.

A GREAT ECCLESIASTICAL SCULPTOR

FIRST ARTICLE.

HE name of Harry Hems, of Exeter, England, is probably familiar to every reader of STONE. Mr. Hems is one of the greatest of modern ecclesiastical sculptors, and his work has been seen and admired in almost every civilized country. The great creations from his studio adorn many of the leading cities, and as Mr. Hems has been an extensive traveler, he has made many warm friends who admire the man as well as his works. It is particularly appropriate that such a magazine as STONE, which deals with the artistic and ornamental, as well as the utilitarian use of marble and granite, should present to its readers a sketch of Mr. Hems and of some of his recent creations.

Harry Hems was born in High street, Islington, London, June 12, 1842. His grandfathers were two of the most celebrated cutlers in the world, his maternal one being George Wostenholm, the famous "I. X. L." cutler of Sheffield. Mr. Hems' mother, still living, and hale and strong at eighty, is his youngest daughter. Thus it will be seen that Mr. Hems' mastery of tools comes to him in the nature of heredity.

Perhaps nothing will give a better idea of the early life of Mr. Hems than a sympathetic sketch recently published in "The Churchwoman," from which we take the liberty of quoting the following:

On a dark, murky, sloppy winter's evening long ago, in the middle of the fifties, a craftsman was working in a small wood-carver's studio in dirty Sheffield—the city of soot. The artist himself was a cripple and a dwarf, wonderfully clever at his craft, but withal, in the narrow circle he was privileged to call his own, a terrible despot.

Amongst his probationers was a pupil, a fair, fresh-complexioned lad of about sixteen, and on the occasion in question he was diligently at work upon an unfinished representation of the Blessed Virgin's face, slicing it dexterously out of a block of yellow pine. A lovely, yet painful countenance it was. The eyebrows, contracted in a manner that betrayed an intensity of mental pain, gave an effect that, obtained by one so young, was really remark-

able. So intently was the youngster engaged at his task that he did not perceive a stranger—perchance a client of his master's—who, having looked into the studio on business, was now watching him earnestly. The visitor was tall and bearded, and had a kindly eye. With an apparently natural sympathy of feeling the newcomer fell into conversation with the lad, and presently, even as they talked, the gong went, intimating to the handi-craftsmen that the labor of the day was finished.

The boy, at this, slowly—it seemed even reluctantly, for he evidently loved his task—pulled off his blouse, and was winding his coarse neck handkerchief, such as working boys then and now wear, around his throat, when his new acquaintance inquired, “And where are you going now?”

“Home,” was the blunt reply of the Yorkshire lad, “and,” he added confidentially, “when I've cleaned myself and had tea I shall get away to the School of Art. I go there every evening, save Saturdays.”

The Sheffield School of Art at that time had the reputation of being the best in England, and had already sent out more pupils, who ultimately made their mark in the art world, than probably had all the rest of the schools of art in the country put together.

“Come home to tea with *me* this evening, instead,” suggested the bearded and muffed one cordially.

“No, I really can't,” said the boy hesitatingly; “I'm neither cleaned nor got a collar.”

“Never mind your collar,” laughed the newly-found friend heartily, “and as for a good wash, you shall have it at my place, so come along.”

And, presently, all obstacles surmounted, off the two trudged together, careless of sleet and sludge, until, at length, down in St. Philips', they reached a modest and unobtrusive dwelling, upon whose front, black-painted door, in large white letters, appeared the words: “MOORFIELD VICARAGE.” There they entered, and throwing off his cloak and scarf, the cheery host bid his visitor welcome. But at this moment, seeing, for the first time, a white “choker” and clerical attire beneath, the youth looked somewhat aghast, and in the homely language of South Yorkshire, exclaimed:

“Aye! Why, meister, you're a minester!”

“And what if I am?” queried his host. “Come and have a wash, and then for tea and teacakes.”

“And thus it was that the late Rev. Greville John Chester, M. A., then vicar of St. Jude's, Moorfields, Sheffield, and Harry Hems, now the widely-known church sculptor, made each other's acquaintance, and first formed a life-long friendship—a happy one—one that only terminated with Mr. Chester's lamented death a few years since. Not that the intimacy so chancely made met with entire approval amongst his friends. Indeed it was quite otherwise, for the young carver's parents were Dissenters of a pronounced type, and so, without exception, were all his relatives. Their alarm, therefore, at the growth of the warm feeling between priest and pupil was candidly expressed, and the lad was solemnly warned on many occasions that he was getting into the “clutches of a Jesuit in disguise, who was leading him to Rome.” The proof of the pudding is in the eating, and we are glad to record that a few years later, the now expert pupil being “out of his time,” left



HARRY HEMS AT WORK IN HIS STUDIO

Sheffield for London, and one of the first things recorded of him is gleaned from a letter written by the then Archbishop of Canterbury, of which the following is a copy:

“Addington Park, Croyden, July 27, 1862.

“Dear Sir—You have my leave to baptize the young sculptor (Harry Hems) who has been under instruction for Holy Baptism, and I hope he may prove a shining light, enlightening others. Believe me, yours truly,

“C. T. CANTUAR,

“To the Rev. Greville J. Chester.”

“Soon after this, acting on Mr. Chester’s suggestion, young Hems went to Italy to study, and there sat at the feet of some of the best masters in Florence and Carrara. There he worked, early and late, hard as a mere *demi-urgus*. Here, too, he was not without adventure, for once he was imprisoned on suspicion of being one of Garibaldi’s conspirators, and as such was thrown into an Italian prison. At length, what with the local disturbances and general depression in all things artistic and otherwise, caused by the civic unrest, now moneyless and forlorn, he made his way across Europe toward home. In the depth of the winter and amid the blinding snow, still he trudged alone over Mt. Cenis, a heavy kit of tools he carried on his back, probably anything but fairly balanced by a very light pocket.

Such, then, is the early history of Harry Hems, the senior member of the famous family of church workers known as Harry Hems & Sons, of Exeter. It is said by the superstitious and the cynical, that the continuous and singular prosperity that has followed both the father and worthy sons is due to the fact that when Mr. Hems, senior, first arrived in Exeter from London (now thirty-three years ago) he happened to pick up an old horseshoe, one that to-day still adorns the main façade of his spacious studio. But those who know him best are well aware that it is rather to sheer right-down hard work, to unwearying application, and to the continuous production of works of the highest ecclesiastical art, which ably hold their own with anything that has been seen during this century, and, last but not least, helped in a large degree by the distinct blessing of God, that his fame is really due.

Of the later life and works of Mr. Hems we must speak in a subsequent number, merely commenting now upon the illustrations that accompany this article. A view of the studios, from which all of the recent notable work has come, is given as a frontispiece. These are the largest studios, devoted entirely to church and religious sculpture in Great Britain, perhaps in the world. They cover two acres, and are built upon Mr. Hems’ own freehold land. Upon this ground is also the pleasant residence of the father and sons; so that the Hems family practically live with their work. Everything even to the minutest detail, receives the personal attention of the principals, and nearly all the members of the staff have been educated by them from boyhood in those true paths of religious art which are now followed with such exactitude. The studios are fitted up with every help and accessory to art, in the way of models, books of reference and appliances, among the latter being a traveling crane, which lifts anything up to twenty tons. The horseshoe, to which reference is made in the article from “The Churchwoman,” was picked up by Mr. Hems when he entered the city from London, Dec. 4, 1866. This



RECUMBENT STATUE OF CANON SMITH IN WEST STAFFORD CHURCH

identical horseshoe can be seen in the illustration still adorning the main façade. The statue of Art, occupying a niche immediately over, appears intent upon the inscription on a label. On this is engraved the legend:

"This place all grew
From an old horseshoe."

The main building and the extensive studios espied in the extreme rear (connected with the main line by tram lines) are all built of the bright red brick of the locality, with dressings of red Corsehill stone. The present studios were built in 1881.

The view of the interior of the studio represents Mr. Hems at work on a grotesque for one of the pedestals at the bottom of the grand staircase in the new Municipal Offices, Bombay, India. The photograph was taken June 12, 1896, upon which day Mr. Hems was fifty-four years old.

Things are old in old England, and people live to be old, too. The study we illustrate is in clay for a life-sized recumbent figure in pure statuary marble. It is photographed from the actual model precisely as it left the tools of Mr. Hems and his sons. It represents a striking—his children say an almost speaking likeness of the late Canon Reginald Smith, who recently died, in the sixtieth year of his rectorship of West Stafford, near Dorchester, in Devonshire, at the venerable age of ninety. The finished sculpture rests upon an ornate altar tomb, surmounted by a mensa of polished Devonshire marble, in the chancel of the ancient church he loved so well and served so long. The altar itself was designed by Mr. Charles E. Ponting, F. S. A., an accomplished architect, and made, like the statue, by Messrs. Hems & Sons.

THE WEATHERING OF BUILDING STONES *



HE stones used in building always begin to wear after they have been laid for some time, and gradually diminish in size until they finally fall to dust. The agencies which produce this effect seem to be invisible, although they are ever present; they are principally air and waters, and it is here intended to show how they work in causing decay.

Building stones, according to their kind and composition, behave in different ways when exposed. Foremost among these stones is granite, which has no definite composition. Typical granite is composed of three minerals, quartz, felspar and mica; these are usually spread irregularly through the mass, the felspar in white, pink or red crystals, the mica in sparkling white or black scales, and the quartz in white patches. In some granites the felspar appears in very large crystals or in veins, in others the mica appears in very large crystals, and these differences naturally produce a great many varieties of the stone. Then, again, there are several kinds of felspar, the commonest being potash felspar (orthoclase); there is also soda felspar (albite) and soda-lime felspar (oligoclase). Two of the several varieties of mica are potash mica (muscovite) and magnesia mica (biotite). Quartz is not variable, and has the same composition as rock crystal—that is, silica (SiO_2). In some granites there is no mica (quartz-porphyry), and many minor differences might be noticed, but it is sufficient to say that granite is a variable stone. Taking, however, the mean of several analyses made by Dr. Houghton, the composition of granite is as follows: Silica, 72.07; alumina, 14.81; oxide of iron, 2.22; potash, 5.11; soda, 2.79; lime, 1.63; magnesia, 0.33; loss on ignition (water, etc.), 1.09; total, 100.05. The mean specific gravity is 2.66. Granite, as a whole, is very durable stone, but the individual minerals in it behave very diversely, when weathered; quartz and mica are practically unaltered, but the felspar is decomposed which causes the granite to slowly crumble away. This weathering, however, is very feeble and hardly noticeable, except when oligoclase is present, as this is a mineral that weathers somewhat rapidly.

Basalt and greenstone may be classed together. They are igneous rocks like granite, but differ from it very much in appearance and composition. Basalt occurs usually in the forms of columns, as at the Giant's Causeway. It is black, or nearly so, very fine grained, and is composed of several minerals—felspar, augite, magnetic iron, etc. These, however, can rarely be detected with the eye alone. Greenstone or dolerite shows larger crystals, and has a green, gray, or black color. Basalt and greenstone contain: Silica, 45 to 55 per cent.; alumina, 10 to 18 per cent.; lime, 7 to 14 per cent.; magnesia, 3 to 10 per cent.; oxides of iron and manganese, 9 to 16 per cent.; potash $\frac{1}{2}$ to 3 per cent.; soda, 2 to 5 per cent.; and loss on ignition, 1 to 5 per cent. Their specific gravity is from 2.7 to 3.1, and they are therefore heavier than granite.

*From "The Settmakers' and Stonemakers' Journal."

They are durable, but not nearly so good in this respect as granite, owing to their containing more of the bases, iron, lime, etc., and much less silica. They are tougher than granite, and make good setts or road metal, but they are not often used for building purposes as they cannot be obtained in large pieces and are difficult to trim with the chisel.

H. B. STOCKS, F.I.C., F.C.S.



CARRARA MARBLE QUARRIES



HE "Illustrated Carpenter and Builder," of London, recently described the quarries of Cipollino, and in the current number it gives a pen picture of the famous quarries of Carrara, from whence comes the most widely known marble in the world. Few of the many tourists, however, who are whirled along the Mediterranean Railway from Rome to Genoa ever stop to visit the spot from which this famous marble is obtainable, says the writer. Carrara lies on the railway between Pisa and Florence, and an excursion to the Carrara Mountains is not difficult. Carrara itself is hardly worth visiting, being simply an aggregation of homely houses on the banks of a muddy torrent at the base of the mountains. The mountains themselves can be seen even from the line of the Mediterranean Railway, the marble cropping out in numerous places. All the inhabitants of the little town are, directly or indirectly, interested in the quarrying, working and shaping of the marble, and the glare of the marble dust and marble meets one on every side. The marble quarries are entirely different from what might be expected, and in place of craning the neck to gaze down into the bowels of the earth one has only to admire the long irregular rift in the flank of the mountain, for the quarrying is all done on the surface, and does not require the construction of pits or galleries. The quarries have been likened by one writer to a cascade of water suddenly hardened into stone.

The percentage of men who meet horrible deaths in the quarries is very large, notwithstanding the fact that powder, and not dynamite, is used. Of course many of these accidents are caused by carelessness on the part of the workmen, but these could in nearly every case be safeguarded against by proper appliances. When the great blocks are once detached, they either roll down the mountain or are lowered to the desired place by means of rope and tackle. No machinery is employed, and all the work is done with the crudest appliances. A blast is announced by three long notes on a horn, but little attention seems to be paid to this signal by the workmen, and many terrible accidents result in consequence.

A few years back, when accidents occurred the cathedral bells were tolled to give warning to the people; but, owing to the anxiety and anguish of thousands of poor families on hearing this gruesome sound, the custom has now been abolished, and the workmen all leave the quarries as soon as an accident occurs in order to assure their families of their safety, and they are allowed their full day's pay. The pay of the workmen is wretched, from 1s. 3d. to 1s.

9d. per day. A blast is very exciting to a stranger, who is usually accompanied by a guide, who contrives to get him in a place of absolute safety during the explosion. The marble is blasted high up on the peak, and the pieces bound or leap downwards until they strike some obstruction in the valley below. Formerly all of the immense chunks of marble had to be transported by primitive carts hauled by oxen, but now the railway affords an easy means of transporting to the market. The huge trucks are met everywhere floundering along, flinging great clouds of choking white dust in their train or splashing mud, which is white in this remarkable locality. Each trolley is drawn by eighteen or twenty pairs of oxen, and these are also covered with the white dust, which is everywhere. They are unmercifully goaded by their cruel drivers, for the Italians are notorious for their cruelty to animals.

An interesting excursion is to one of the quarries which were worked by the Romans, and the quarries show how primitive were the means employed by these laborers of antiquity. They first marked out the block upon the solid mass, and they actually cut it out by hand labor. In many places one can still see blocks which lie embedded in the rubbish caused in quarrying them and shipping them. The Romans split their blocks into slabs by inserting wooden wedges and keeping them continually wet until the swelling of the wood burst asunder the stone. A Roman altar was unearthed some years ago near the quarries, and a few rusty implements have also been discovered.

The views from the mountains are superb. To the east lies Tuscany, and to the south on a clear day can be seen the blue coasts of Corsica and Sardinia. Carrara marble, which is worked in the usual methods, is largely used for decorating churches, altars, etc. It has been a favorite with sculptors for nearly 2,000 years, and for statuary it is to-day used in preference to marble from any other locality.

So much for the picturesque side of the Carrara quarrying industry. The latest development on the practical side is given in the current number of "The Quarry and Builders' Merchant," which says: It has been rumored for some time past that attempts were being made to amalgamate the various interests controlling the output of Carrara marble, and that a company was about to be formed with the object of giving effect to that purpose. Few industries would seem to more readily lend themselves to amalgamation of the kind. Carrara marble has been famous for thousands of years, and at the present time it is in much and growing request. It is only to be got from Carrara, and its immediate neighborhood, in the range of mountains between Carrara and Massa, and within a very small area. It would seem natural, therefore, that attempts should be made to bring control of the output under one direction. The marble quarries are owned by a large number of persons, and competition has led in this industry, as in so many others, to cutting rates. This rate cutting can only be effectively stopped by one proprietary getting a controlling interest in the quarries, and some seven years ago an attempt was made by a powerful American syndicate to secure this control. But the price asked was so heavy that it was found impossible to raise the necessary capital, and the scheme of amalgamation slumbered until some two years ago, when it was taken in hand again, and the result is the Anglo-Carrara Marble Quarries, Limited. This company is about to be brought out

with a capital of £600,000, and it has secured quarries whose output amounts to nearly 80,000 tons. In addition, there is good reason to believe that before the company has long been at work it will control more of the properties now outside the amalgamation. Attention may be invited to the very full particulars of the properties offered to the public, to be found in the reports enclosed with the prospectus. The inexhaustible quantity of the marble on the properties taken over by the company is certified by that eminent geologist, Prof. Boyd Dawkins, who visited the quarries for the purpose of making his report to the company, and the value of the quarries, and the way in which profits may be added to very largely by more modern methods of working, is testified to by Messrs. Bramwell, Harris & Co., the well-known engineers, whose Mr. Harris visited the properties for the purpose of reporting. It may be said that though there is plenty of marble of the best quality on the properties to be taken over, there is not, or may not be a market for it. That objection, if it be taken, is dealt with very fully in the report of Mr. Burke, enclosed with the prospectus. It is the report of a man who speaks with the authority of one who has been largely connected with the marble trade for thirty or forty years, and other evidence in support of Mr. Burke's statement is not wanting. In fact, it is as certain that the market can be found for the marble as it is that with improved methods the stone itself can be got from the quarries at a much less cost than at present. The market has indeed never been properly worked, and if only the business is pushed there may well be an enormous extension of the already large use of Carrara marble in this country, the United States and the colonies.

QUARRYING METHODS

DOUBT may exist whether there is any business process, relating so intimately to modern life, that is so little understood by the general public as quarrying. Beyond the fact that a quarry is a place from whence stone for building or ornamental purposes is obtained, there are thousands of people of a wide range of knowledge who could give little further information. The methods by which the quarries are worked and the processes by which the different kinds of stone are got out of the earth are wholly unknown to them. I think it may be worth while, therefore, to give in such a magazine as STONE a simple and familiar account of the quarrying business.

The process of quarrying stone must be divided into various heads, suggested by the kind of stone obtained and the purpose for which it is to be used. To quarry for building purposes where common rubble only is required, no particular care is necessary. The problem is simply to get out the largest quantity at the least possible expense. This is done by blasting, with holes drilled with such judgment as to obtain the best results. But to quarry for mill blocks, dimension stone, broken ashlar, etc., in the same quarry, requires a wide knowledge of mechanics. First comes the stone that is formed by deposit and is found in beds from two inches to several feet in thickness, such as sand or freestone, limestone and all stone found in natural beds. In

STONE.

sandstone or freestone quarries where beds are from six to ten or more inches thick the methods are as follows: When found in solid ledges without natural heads or dries, shearings have to be made either by hand or with a channeling machine to make open ends. When this has been done, holes are drilled of large dimension on top of the ledges to a depth of 18 to 24 inches; two feathers (small pieces of half-round iron), are placed in each hole and tapering wedges or plugs driven between them. This breaks the ledges into large blocks clear across the quarry. These are cut into what are called mill blocks, of such sizes that they will be suitable for transportation, and of the right dimension to be sawed under a gang saw. What is left from the cutting of the mill blocks is used for dimension stone. Where natural seams occur that prevent blocks being cut out large enough for mill blocks, these smaller cuttings are used for dimension stone, such as for ashlar in courses. What is left unsuitable for course work is used for broken ashlar or broken range work. The pieces left after all of this selection are used for common rubble or building stone.

What is called the Knox system of blasting is being used largely in many quarries where the ledges are from a thickness of 4 to 12 feet or more. Holes are drilled to the desired depth, 12 or 18 inches apart, then reamed out with a steel bit having two sharpened edges. The reaming is done by driving the ream down, it being larger across than the holes already drilled, thus making a cut or crease on each side of the hole, all of the cuts being in perfect line with each other. A small quantity of black powder is put in each hole with electric fuse. The wad is then inserted a certain distance from the top, leaving an air chamber. Then the holes are rammed tight above the wads, the wires are connected with the battery and the charge is fired. If the work has been done with judgment under the direction of men of experience, and using the right quantity of powder, the stone will break in a straight line for a distance of 30 to 40 feet. This system is a very great saving of labor and is successfully used in many quarries. Where the geological conditions are favorable, with heads 20 to 40 feet apart, the Knox system can be used most advantageously, as the stone can be cut between the heads very cheaply. The process of quarrying limestone is very similar to the above.

The quarrying of granite differs considerably according to the position in which the stone is found. Granite is what is called a primitive rock, not being sedimentary, and is rarely found in ledges, although in many places there are natural heads, geological breaks, or dries, that take the place of natural beds, although they generally occur in a vertical position or dipping at a very sharp angle. For many purposes for which granite is used, quarries thus favored with plenty of natural heads and breaks are profitable to operate, but where the stone is required to be of very large dimension it must be taken from a quarry where the granite occurs in large solid masses. Here the work is as follows: A deep and long face must be exposed, and 20 or 30 feet back from that, deep holes are drilled, and here again the Knox system can be used to great advantage in making the first break. After this break the holes are cleaned out, and the charge of black powder increased to open the break still further, so that the seams can be filled with black powder. Dry sand is run on top of the charge, and the blast pushes the large body of the

rock out so that it can be cut up with plugs and feathers to any desired size. This is called a sand blast, the effect of the sand being to exclude the air sufficient to let the force of the powder move the large body of rock from its place. Frequently blocks of granite are turned over in this way to the extent of hundreds of tons. In quarries that have numerous vertical heads, the driving and blasting is generally done with horizontal holes, but under these natural conditions quarrying is an easy matter.

Marble quarrying is an entirely different process. The first object to be sought here is to get a large smooth surface so that channeling machines can be operated. When this is done and all the refuse stock taken off down to the solid rock, the channeling machine is put to work. This cuts channels 6 to 8 feet deep and $2\frac{1}{2}$ inches wide across the entire surface of the quarry at any desired distance apart. After this has been done, one block called the "key block," is taken out by breaking it up in the best method available in order to make room for what is called the gadding machine. This is used to drill holes at the bottom of the channel cut along a level. Large plugs and feathers are used in these holes, and by forcing them in blocks of marble can be lifted up clear across the quarry. When the lift has been made, blocks are cut of any desired length suitable for mill stock, and these are hoisted out of the way. The process is repeated until all of the channeled cuts are lifted; then the process of channeling goes on again on a lower level.

JAMES B. GORDON.

ROSCOE, N. Y.



MARBLE IN INTERIOR WORK

HE changes in modern methods of construction have brought about a great increase in the use of marble for interior work. This fact gives particular interest to the following article from the "Illustrated Carpenter and Builder," of London: In forming designs with variously-colored marbles, it is most essential to so arrange the materials as to produce agreeable decorative results. There are certain principles of color decoration recognized among artists who work with paint or distemper, and these principles should, as nearly as possible, be followed in dealing with the natural colors of marble. One of the first rules to be remembered is that the lightest colors should be applied to the largest apparent surfaces. We say apparent, because the surface of a panel may not exceed the united superficies of its stiles and ridges, but it should be lighter than these latter, because its surface is apparently larger, being seen in one mass.

No color in a decorative composition should appear isolated or strike attention on account of its singularity. To avoid this and to produce a generally harmonious effect the same color should be repeated; thus the general color of a dado may be repeated, although in smaller sizes in other parts of the composition. The colors in the skirting should be repeated in the dado, capping, and again, perhaps, in the cornice, and in the case of a marble ceiling some of the color in it should be identical with some of those in the wall paneling, although the latter may well be darker in its general tone. The darker

and heavier colors should occupy the lower part of a composition, and the lighter colors the upper parts. Heavy colors of no very decided tone may very properly prevail in floors, to which they give the appearance of firmness and solidity; but it is necessary to be very careful in the matter, otherwise an effect may be given which will make a floor appear as if it were laid in ridges or upright cubes.

The primary colors—red, blue and yellow—are usually sparingly employed, blended tints being mostly applied to large surfaces. In marble the pure primary colors are not available in large sizes, as their effects are subdued by means of veins and blended colors. It is easy, therefore, to avoid glaring effects, the difficulty being, on the other hand, to obtain any pure color at all. Pure blue in any considerable size is never found. In ceilings, or in similar situations, bluish-gray or bluish-white marbles will best produce the desired effect—distance and size. With red, yellow and orange the contrary result is obtained, and these should therefore be applied to parts it is desired to bring into prominence.

A sense of coldness is produced in a composition in which blue and white predominate, while red, yellow and gold convey the impression of warmth. It is desirable to remember this when designing the fittings and decorations of shops and business premises. A hall or antechamber can be made to heighten, by contrast, the glory of an interior beyond if it be paneled with white or pale gray marble, with the dado, cornice and framing in dark gray, and some of the principal mouldings in black. Red and yellow convey the impression of warmth. It is an error to employ too many varieties of color in one composition. Some of the finest decorative effects have been produced by not more than three varieties of colored marble.



KELSO BRIDGE OVER THE TWEED

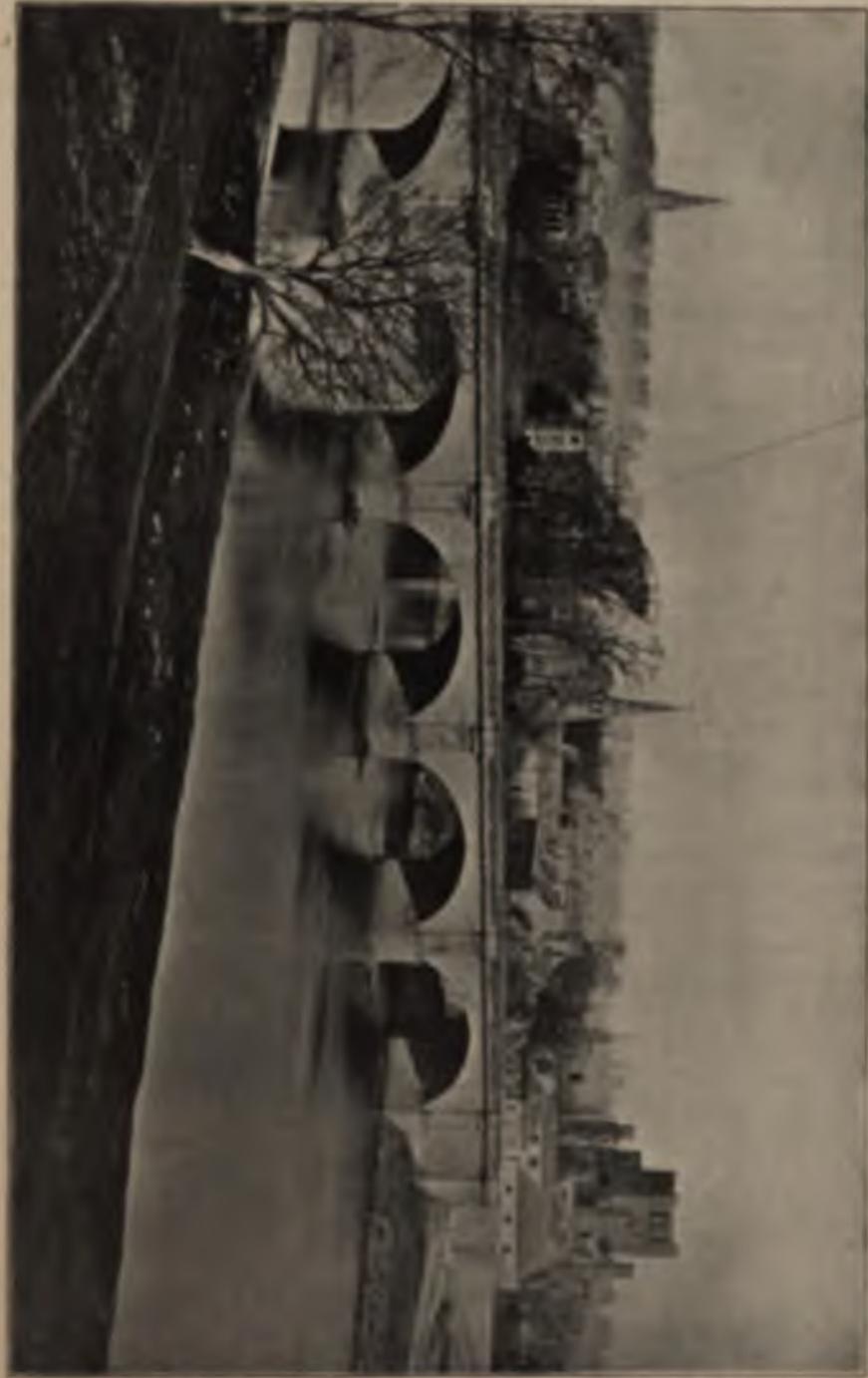


HE location of the Kelso bridge is near the junction of the Tweed and Tevioit Rivers, where the scenery is most beautiful. It was designed by Rennie, and is of practically the same style as his Waterloo bridge, which was built at a later date. There are five equal spans of 72 feet each and a rise of 20 feet 9 inches, while the width is 26 feet. The arches are elliptical, with the arch stones tailed into the spandrel courses. The piers have semi-circular ends and support two Doric columns and entablature, on which rests the cornice. The roadway is perfectly level throughout, and is guarded by solid parapets, with retreats over the piers. The abutments also have columns supporting the cornice, and quadrant concave wing walls.

The severeness of the design, together with the height above the stream, gives the structure an imposing appearance and makes it appear that the spans are quite large. The ruins of Kelso Abbey to the right adds materially to the view. This bridge was completed in 1799 and the Waterloo bridge begun in 1811. The Waterloo bridge had nine elliptical arches of 120 feet and was one of the first bridges constructed over the Thames with the roadway nearly level.

"F."

THE BRIDGE OVER THE TWEED



SIMPLE ROUGH METHODS FOR THE DETERMINATION OF MINERALS AND ROCKS*



N mining and quarrying it often happens that minerals are met with, the nature of which can be roughly ascertained by simple tests. Rocks, also, can often be approximately determined from an examination of a hand specimen in the field, without resorting to elaborate chemical or microscopical methods suitable only for a well-furnished laboratory.

Of course, it is not to be supposed that these rough and ready tests are in all cases infallible, or that a more careful and minute examination can be dispensed with; but they nevertheless serve as a useful preliminary guide to the character of the specimen, and enable a more correct judgment to be formed as to whether it will be worth while to submit it to more precise investigation. The mineral, for example, may be of some possible economic value, or it may be utterly worthless. The rock may have the appearance of being a useful building stone or road stone, but its value for these purposes may be marred by some mineralogical peculiarity which is readily ascertainable.

The apparatus and reagents employed in the following tests include only such as can be readily and cheaply procured packed in cases suitable for use either at home or in the field. Facility of manipulation will be readily acquired with practice, which should, in the first place, be obtained by experimenting with known specimens. Doubtful cases can often be settled by comparison with known types.

The method adopted in the following tables is based on the principle that the specimen either will or will not answer to a definite test, the result being that the investigator is gradually led, by the adoption or rejection of each proposition to its final identification. Of course, it would not be possible to include every possible species in such tables as these without unduly increasing their length and complexity. A selection has, therefore, been made of those which, owing either to their more common occurrence or exceptional economic value, are of importance in practical geology.

SCHEME FOR THE EXAMINATION OF MINERALS.

Table I.—The Mineral has a metallic lustre.

1.	Heated on charcoal in the blowpipe flame:	
a.	It gives off fumes	2
b.	It does not give off fumes	12
2.	a. The fumes smell of burning sulphur.....	3
	b. The fumes smell of garlic.....	9
3.	a. It is not scratched by a knife, but scratches glass easily..IRON PYRITES	
	b. It is scratched by a knife, and does not scratch glass.....	4
4.	a. Its streak is not metallic.....	5
	b. Its streak is metallic.....	7

*From "The Quarry and Builders' Merchant," London.

5.	a. It is wholly volatile before the blowpipe.....	CINNABAR
	b. It is not wholly volatile.....	6
6.	a. It is brass yellow in color.....	COPPER PYRITES
	b. It is black or red, giving off white fumes when heated in blowpipe flame	ANTIMONIAL ORES
	c. It is leaden or steel grey, fusing and giving off white fumes in the blowpipe flame.....	STIBNITE
7.	a. It is infusible in blowpipe flame.....	MOLYBDENITE
	b. It is fusible.....	8
8.	a. It is leaden or steel grey, with cubical cleavage.....	GALENA
	b. It gives on charcoal a globule of silver.....	SILVER GLANCE
	c. It yields a magnetic globule.....	PYRRHOTINE
9.	a. It is not scratched by a knife.....	10
	b. It is scratched by a knife.....	11
10.	a. It is white, metallic, massive or in flat prisms.....	MISPICKEL
	b. It is tin-white or steel-grey; octahedral.....	SMALTINE
11.	a. It has a white streak, tarnishing black.....	ARSENIC
	b. It has a carmine streak.....	ARSENICAL SILVER
	c. It has a copper red streak.....	ARSENICAL NICKEL
12.	a. The substance is malleable.....	NATIVE GOLD, COPPER, PLATINUM, SILVER, IRON
	b. The substance is brittle	13
13.	a. It is easily fusible.....	BISMUTH
	b. It is not easily fusible.....	14
14.	a. The borax bead is colored, CHROMIC IRON (green), MANGANESE ORES (purple), MAGNETITE (bottle green or yellow), SPECULAR IRON (bottle green or yellow), WOLFRAM (green)	
	b. The borax bead is not colored.....	15
15.	a. The mineral is harder than calc spar.....	16
	b. The mineral is not harder than calc spar.....	17
16.	a. It is soluble in nitric acid, and scratched by a knife.....	BLENDE
	b. It is insoluble in nitric acid, not scratched by a knife.....	TIN STONE
	c. It dissolves slowly in nitric acid when powdered, and gives a black streak.....	PITCH BLENDE
17.	a. The mineral is black.....	GRAPHITE
	b. The mineral is lead grey.....	MOLYBDENITE

Table II.—The Mineral has not a metallic lustre and is insoluble in water.

1.	a. Streak black or colored.....	2
	b. Streak white or nearly so.....	5
2.	a. Heated in blowpipe flame it gives off fumes or odor.....	3
	b. It gives no fumes or odor when heated.....	4
3.	a. Color and streak yellow, burns with blue flame.....	SULPHUR
	b. Color orange, streak red, volatile, garlic odor.....	CINNABAR
4.	a. Borax bead is colored purple.....	MANGANESE ORES
	b. Borax bead is colored green.....	CHROME IRON
	c. Borax bead is colored green (hot), blue (cold).....	COPPER ORES
	d. Borax bead is colored yellow or bottle green.....	IRON OXIDES

5.	a. The mineral is scratched by quartz.....	6
	b. It is not scratched by quartz.....	VARIOUS GEMS
6.	a. It is soluble in nitric acid, scratched by a knife.....	7
	b. It is insoluble in nitric acid, hot or cold.....	17
7.	a. It is easily fusible in blowpipe flame.....	8
	b. It is not easily fusible.....	9
8.	a. It is green, yellow, or brown, does not effervesce with acid, and gives a lead bead on charcoal.....	PYROMORPHITE
	b. It is white or grey, effervesces with acid, and gives a lead bead when heated on charcoal.....	CERUSSITE
9.	a. It dissolves in cold nitric acid with brisk effervescence..	10
	b. It is soluble with difficulty in nitric acid.....	12
10.	a. It is white, crystalline, massive, or fibrous.....	11
	b. It is yellow, red-brown or black, resinous lustre.....	BLENDE
11.	a. It does not crumble or powder in blowpipe flame.....	CALCITE
	b. It flies to powder in blowpipe flame.....	ARAGONITE
12.	a. It dissolves slowly in cold nitric acid.....	13
	b. It dissolves with effervescence in hot nitric acid.....	10
13.	a. It effervesces with cold nitric acid.....	DOLOMITE
	b. It does not effervesce.....	14
14.	a. It leaves a jelly of silica.....	SILICATE OF ZINC
	b. It does not leave a jelly of silica.....	15
15.	a. Lustre glassy	MAGNESITE
	b. Lustre resinous	APATITE
16.	a. It gives a lead bead on charcoal.....	CERUSSITE
	b. It gives a bottle green borax bead.....	CHALYBITE
	c. On charcoal it is yellow hot, white cold.....	CALAMINE
17.	a. It is easily fusible before the blowpipe.....	18
	b. It is not easily fusible.....	24
18.	a. It is soft, waxy and greenish.....	HORN SILVER
	b. It is not soft and waxy.....	19
19.	a. It swells up and melts under blowpipe.....	ZEOLITES
	b. It does not swell up or melt.....	20
20.	a. Hardness, 5.0—7.0.....	21
	b. Hardness, 2.0—4.0	22
21.	a. It is white, silky and fibrous.....	ASBESTOS
	b. It is green or black, prismatic.....	HORN BLENDÉ, AUGITE
22.	a. It is white or grey, lead bead on charcoal.....	ANGLESITE
	b. it is green or brown, resinous lustre	PYROMORPHITE
23.	a. It is easily scratched by quartz ($H = 1 - 3.5$).....	24
	b. It is harder than heavy spar	29
24.	a. It splinters before the blowpipe; heavy.....	BARYTES
	b. It is not heavy and does not splinter.....	25
25.	a. It is massive or crystallized in prisms.....	26
	b. It is in thin scales or plates.....	27
26.	a. It is greenish, with greasy feel.....	SERPENTINE
	b. It is white, with greasy feel.....	STEATITE
	c. It is white, fibrous, with pearly lustre.....	GYPSUM

27.	a. It is in thin flexible laminæ.....	MICA
	b. The laminæ are not flexible.....	28
28.	a. It has a pearly lustre and greasy feel.....	TALC
	b. It is dark green	CHLORITE
29.	a. It flies to pieces when heated.....	30
	b. It does not fly to pieces.....	31
30.	a. It is massive or crystallized in cubes.....	FLUOR SPAR
	b. It is crystallized in six-sided prisms, resinous lustre.....	APATITE
31.	a. It is milky, never crystallized, conchoidal fracture.....	OPAL
	b. It is crystallized	32
32.	a. The crystals are dodecahedral.....	GARNET
	b. The crystals are prismatic.....	33
33.	a. The mineral is fibrous	HORNBLENDE OR AUGITE
	b. It is not fibrous.....	34
34.	a. The mineral has cleavage planes.....	FELSPAR
	b. It has no cleavage planes, glassy lustre.....	QUARTZ
	c. It is greenish yellow	OLIVINE
	d. Black, becoming electric when rubbed.....	TOURMALINE

Table III.—*The Mineral is soluble in water.*

1.	a. It is colored	2
	b. It is white or colorless.....	3
2.	a. Blue color ; borax bead green (hot), blue (cold)	COPPER SULPHATE
	b. Green color ; magnetic mass on charcoal.....	IRON SULPHATE
3.	a. White residue on charcoal, becoming green on reheating with cobalt nitrate	GOSLARITE
	b. White residue on charcoal, becoming blue on reheating with cobalt nitrate	ALUM
	c. White residue on charcoal, becoming pink on reheating with cobalt nitrate	EPSOMITE
	d. Fuses on charcoal to liquid bead.....	4
4.	a. Causes charcoal to burn vividly	NITRE
	b. Having taste of common salt.....	ROCK SALT

SCHEME FOR THE DETERMINATION OF ROCKS.

1.	a. The rock is <i>crystalline</i> , showing a distinct granular structure, the grains being either crystals or crystalline particles, not water-warm or fragmental in appearance	2
	b. The rock is <i>compact</i> , having a homogeneous texture, with no recognizable particles or crystals.....	12
	c. The rock has a fragmental appearance, the component grains being either loosely aggregated or cemented into a hard mass	17
2.	a. The crystals show no definite arrangement.....	3
	b. The crystals are disposed in roughly parallel laminae....	11
3.	a. The rock is essentially composed of one mineral species only.....	4
	b. The rock is composed of more than one mineral.....	7

STONE.

4.	a. The rock can be easily scratched by a knife.....	5
	b. The rock is not easily scratched by a knife.....	6
5.	a. It effervesces briskly with acid.....	LIMESTONE
	b. It effervesces when powdered, but less briskly.....	DOLOMITE
	c. It does not effervesce	GYPSUM
6.	a. The rock is greenish, scratched with difficulty....	HORNBLENDE ROCK
	b. The rock is white, yellow or red, quite unscratched by a knife	QUARTZITE
7.	a. The rock is holo-crystalline in texture.....	8
	b. The rock has a crypto-crystalline matrix, with porphyritic crystals embedded in it.....	10
8.	a. Quartz and felspar are essential components.....	GRANITE
	b. Quartz is not an essential component.....	9
9.	a. Hornblende and felspar are essential components, SYENITE OR DIORITE	
	b. Striated felspars with dark crystals or augite and mag- netite are present	DOLERITE OR GABBRO
10.	a. The rock shows distinct crystals of quartz.....	ELVAN
	b. The rock shows distinct crystals of felspar.....	FELSPAR PORPHYRY
	c. The rock is rough to the touch, with crystals of sanidine..	
		TRACHYTE OR RHYOLITE
11.	a. The rock is a granite structure.....	GNEISS
	b. The rock is fine grained and foliated.....	SCHIST
	c. The rock has a fissile structure and earthy odor when breathed upon	SLATE
12.	a. The rock is glassy or resinous, not scratched by a knife..	OBSIDIAN OR PITCHSTONE
	b. The rock is translucent and horny, not scratched by a knife	CHERT
	c. The rock has a dull close-grained granular texture.....	13
13.	a. The rock is easily scratched by a knife, and effervesces briskly with acid.....	LIMESTONE OR CHALK
	b. It is easily scratched, but does not effervesce.....	14
	c. The rock is not easily scratched.....	15
14.	a. It is white, yellow or reddish, often fibrous.....	GYPSUM
	b. It is white, compact, and soapy to the touch.....	STEATITE
	c. It is dark green, reddish or blotched, with soapy feel....	SERPENTINE
15.	a. It is grey, yellowish, or bluish, rings under the hammer..	PHONOLITE
	b. It is black or dark green ; weathered crust brown.....	BASALT
	c. It is scratched with difficulty, or not at all.....	16
16.	a. Scratched with difficulty, smooth texture	FELSITE
	b. Scratched with difficulty, rough texture.....	TRACHYTE
	c. It is not scratched	QUARTZITE
17.	a. The fragments are large.....	18
	b. The fragments are small	19
18.	a. The rock consists of cemented pebbles.....	CONGLOMERATE
	b. The rock consists of cemented angular fragments.....	BRECCIA
	c. Fragments are of organic origin; rock effervesces with acid	FOSSIL LIMESTONE

19. *a.* The rock consists of cemented grains of quartz. SANDSTONE
b. The rock consists of roe-like grains and effervesces. OOLITE
c. The rock is extremely fine-grained, having an earthy odor
when breathed upon CLAY OR SHALE

In examining rocks it must be remembered that the precise character and name cannot always be stated with certainty from an examination of the hand specimen alone. A pocket lens will generally be necessary to determine the structure of fine-grained varieties, and a microscopic investigation is often the only trustworthy guide. The above table will be useful as a preliminary step, and will be sufficient to give an approximate idea of the nature and probable economic value of the rock under examination.

J. VINCENT ELSDEN, B. Sc., F. G. S.



FAMOUS SINGLE STONES

PERHAPS no stone on the American continent has been the cause of so much comment and controversy as the calendar stone of Mexico. This extraordinary stone is now known to be over 2,000 years old, and it is claimed for it that divisions of the year carved upon it, as read by men versed in the language and writings of the Aztecs, the Toltecs and the more ancient Mayas, are nearer the current astronomical divisions than systems made use of by the civilized nations of to-day, a fact that speaks well for the astronomical and mathematical knowledge of the ancient Mexicans.

The history of this stone is very interesting, but I cannot do more than give a few facts concerning it at this time. Before the conquest of Mexico by the Spaniards the stone rested in a great temple which stood on the site where the Cathedral of the City of Mexico now stands. At the time of the conquest the stone, which was held to be sacred, was undoubtedly buried by the Mexicans in order to prevent its falling into the hands of the Spaniards.

In December, 1790, the Mexican government made improvements on the principal square, and the workmen, while digging some trenches, unearthed the stone within 240 ft. west of the second door of the National Palace and 101 feet north of the flower market. As will be seen by the illustration, some portions of the uncarved part of the stone had been broken away, but the important part was almost as perfect as when it left the sculptor's chisel, and from the appearance of the stone as it is now seen it is reasonable to suppose that it was originally a rectangular parallelopiped. The principal face is square. The carved part is not in the center of the stone, but is a little to the right. The diameter of the circle in which the figures are wrought measures 11 feet 9 inches, and the edge of it nearly coincides with the edge of the stone. This means that there was originally another stone laid side by side with this, which, together with this, represented all the feasts and ceremonies of the old religion of the Toltecs. The weight of the stone is 24 tons; it is very hard, and it is difficult to imagine its being carved without the



THE CALENDAR STONE OF MEXICO.

aid of hardened steel tools. The carving is well done, and the divisions are exact and well balanced.

It would take up too much space to give a full and elaborate account of the meaning of the figures on the stone, and connect them with their religious significance. Each figure, however, represents something connected with their gods, astronomy, church days, great events of the past, atmospheric disturbances, phases of the moon, eclipses, floods, seeding time and harvest, and many other phenomena. The central figure represents the sun, the pointed figure over it the south, while the four figures, R-R-R-R, with curves on their feet, are the cardinal points. Indeed, the stone is a marvelous scientific exhibition and contains more on its face, when understood, than many a bulky scientific volume of modern production. It is a wonder and casts of it are valued highly, and many of them have found their way into the most noted museums of Europe and America.

FRED T. HODGSON.

MEXICAN BUILDING METHODS



CURIOS feature of Mexican building is that the lime is brought to the building where it is to be used in large jute or hemp sacks, and is allowed to slack before being mixed with water and sand.

In many places throughout the city there are places wherein the lime is thrown loosely in a pile in one corner awaiting purchasers. It is claimed here, says a correspondent of "Architecture and Building," writing from the City of Mexico, that the lime is much improved by being exposed to the air, and judging from some of the construction I have seen, I do not doubt it.

For mortar boxes the laborers construct a sort of reservoir of sand about 15 inches high and about 8 or 9 feet in diameter, in which reservoir the mortar is mixed. The mixing hoes are clumsy affairs of wood, with handles about 3 inches in diameter and 10 or 12 feet long. The part of the hoe which is usually made of metal is made of wood about 2 inches thick and 15 inches in length and 12 inches wide at its widest part, tapering to the ends. With this hoe they manage to mix quite good mortar. Very little cement is ever used in their mortar.

The most, or nearly so, interesting part of their methods is the manner in which their scaffolds are erected and the manner of ascending and descending the same. The uprights are made of timber about 4 by 8 inches and 12 feet long, and are fastened together with ropes, and the cross pieces are made of the same sized timbers and are also fastened to the uprights by ropes. These cross pieces are placed about 3 feet apart vertically and 9 feet horizontally, and from the ground to the working height of the scaffolding the laborers carry the mortar, brick, stone and tepetate upon inclining planes having a rise of 3 feet in a run of 10, and zigzag back and forth, much the same way as mountain trails are cut up the side of a very steep incline.

In very few instances are hoisting tackles used; only, in fact, when the stone to be lifted is too large to be handled by hand. The hoisting apparatus usually consists of a double and single block operated by several laborers, windlasses being almost an unknown quantity. The men hoisting the stone will catch hold of the rope, and, getting in the center of the street, will pull and haul until the stone finally reaches its destiny. Then the hoisting apparatus is made fast to a post or some portion of the building, and the whole force will ascend the scaffold and exert themselves to their utmost to get the stone landed on the wall where it ultimately belongs.

In some cases, where the stone is unusually large, it is propped up from below to sustain it in position until the wall above is sufficiently heavy to hold it in place.

After the stone water table has been in place, it is covered with mud and small pieces of brick to prevent it from being broken by falling material as the work progresses in height. Window sills and caps are treated the same way. It does not matter what the color of the stone may be, this mud and

brick are placed on it just the same, and I often wonder how it is thoroughly cleaned off. It probably does not matter much, as the most of the stone work soon assumes a very dirty aspect.



PRACTICAL STONE-CUTTING, XVIII

PLATE 17. Explanation of the "Prismoidal or Falling line" system, by means of which the moulds, etc., may be developed as required in order to form the lower piece of coping, the plan, description, etc., of which is given in plates 15, 16.



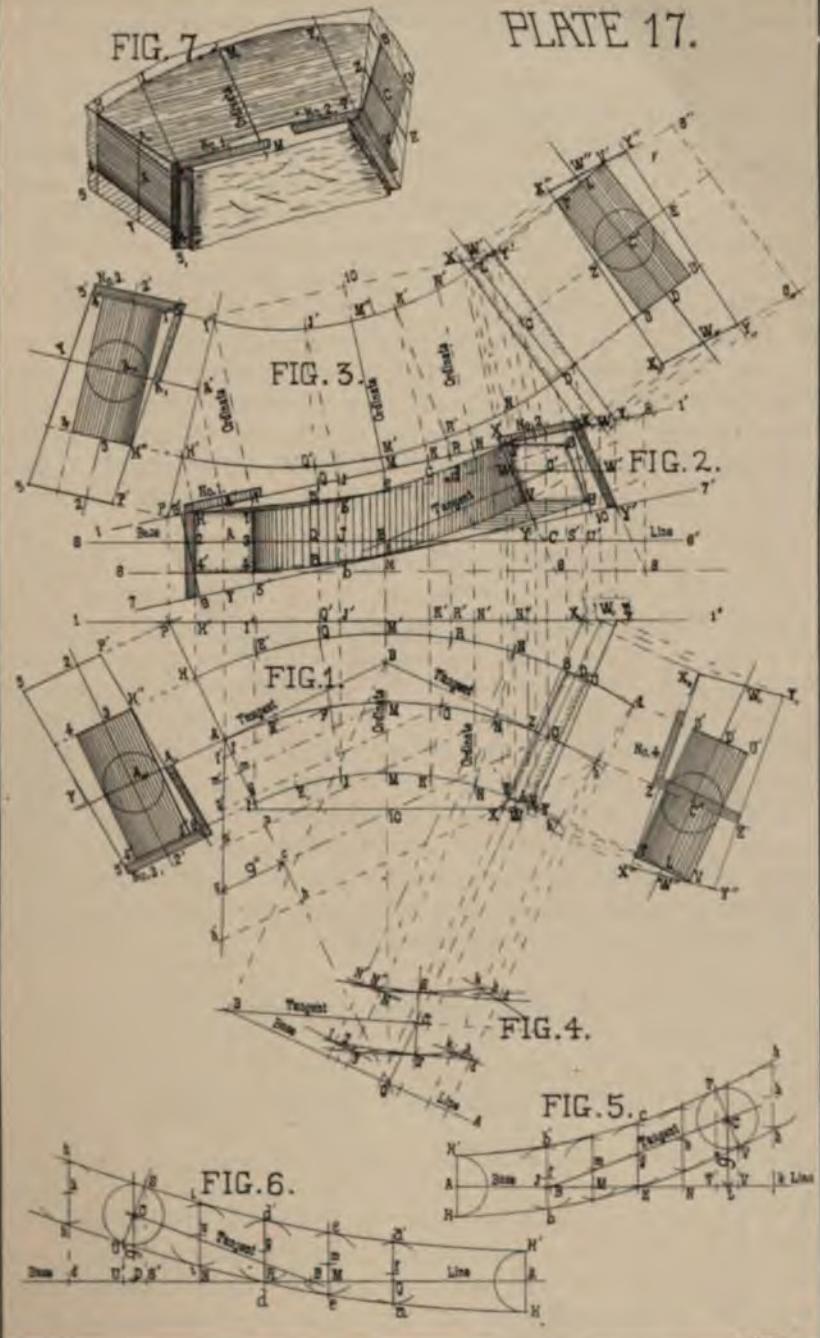
N Fig. 1, H-M'-D, A-M-C, and I-M-L show respectively the convex center, and concave plan curves of the coping. The tangents to the center points A-C of the joint surfaces are given in A-B-C. For a brief explanation of the geometrical principles involved in the construction of the diagrams of this plate we may refer our readers to that given in Plate 13.

In Fig. 2 is shown the vertical projection of the solid, the projection of which may be made as follows: First, draw the base line 6-6 parallel with P-I' of the plan; then from H-E'-Q, etc., Fig. 1, square up lines as shown; this done, set off H-2-4 of the lower, S'-S and U'-U of the upper joints, equal respectively with H'-A-H, S'-S, and U'-U of the face mould, Fig. 6; then drawing H-I and 4'-4 of the lower, and S-T, U-V of the upper joint surfaces, parallel respectively with the base line 6-6', the projection of the joint surfaces may be obtained.

The points through which to trace the curves of the solid may be found as follows: Take, as example, the points given in a'-a, of the convex, and b'-b of the concave surfaces. Set off a'-Q-a, and b'-J-b equal respectively to the similar projections of Figs. 5-6; the points thus obtained in a'-a, and b'-b are those through which the curves pass. In a similar manner may a number of points be projected. Having traced the curves, set off C-C' of Fig. 2 equal with D-C of Fig. 6 (equal to 9 inches, the rise of the coping). Now joining B-C', we obtain the vertical projection of a Plane Tangent with the center point C' of the upper joint surface. Through C' draw W-W' parallel with 6-6'. Then having projected W-W, of the plan in W-W' of Fig. 2, through W-W' square with B-C' draw X-Y, and X,-Y'. This gives in X,-X-Y-Y' the projection of the surface which belongs to the upper joint of the solid. Now enclose the solid of the coping within the smallest rectangle that will contain it; that is, draw the lines 1-1', 7-7', to touch respectively the lowest point at M, and the highest points as H-T. Then drawing 9'-9, and 10'-10 as shown, and the elevation of the prism may be obtained. The length is given in 9-10, the height in 9'-9 and the width in M'-10 of Fig. 3. These are respectively equal to 4'-5": 1'-11": and 11 inches. Total cube contents of rough prism equals 7'-9"; being just about one-half of that as required by making use of the "Tangent System" method of construction.

Now to develop the bed mould shown in Fig. 3: Square with 1-1' of Fig. 2 from the points given in H-I-Q, etc., draw H-H', I-I', Q-Q', etc., respectively equal with H'-H, I'-I, Q'-Q, etc., of the ordinates of the plan; place pins in the points obtained and bend a flexible strip around them and

PLATE 17.



trace the curves. Then join H'-I', which gives the joint line of the lower joint surface. In a similar manner joining X,-X' and Y,-Y', and the joint lines as required respectively at the upper and lower working surfaces of the prism may be obtained.

Now to project the section, etc., of the lower joint surface: First, parallel with P-I' of Figs. 1-3, draw 2-2', which gives the center line of the right section of the coping. Then from P-H-A, etc., square over lines as shown; now set off 6-I"-2'-4'-5' equal with I'-I-3-4-5 of Fig. 2; make 3-H" equal with 2-H, Fig. 2; then join 6-H", produced to P, and 5'-5 parallel with it, and the top and under lines of the prism may be projected. Then joining H"-I", and draw 4'-4 parallel with it, and the right section of the coping as required at the lower joint surface may be obtained. A bevel, No. 3, will give the direction of "plump" lines, the construction of which may be seen on an inspection of the diagram. To obtain the projection of the section of the upper joint surface: Parallel with W,-W' of Figs. 1-3 draw W,, -W". This gives the center line of the right section of the coping. Then from X,-W,-Y, S-D-U, etc., square over lines as shown. Then set off X,, -W,, -Y,, equal with X,-W'-Y' of the convex face of Fig. 2; repeat the operation at the concave face, then joining X,, -X"-X,, -Y,, and parallel with them the lines X,, -Y"-X"-Y" and the section of the prism at the upper joint surface may be obtained. Now bearing in mind that the top and under bed lines of the right section of the coping are parallel with each other at the joint surface, with C' as center and the half thickness of the coping as the radius, draw an arc as shown; then parallel with W,, -W" draw S-T and U-V', which give the projection of the bed lines in question. Now projecting S-D-U, etc., into like points of the sections, the contour of the mould may be obtained. Now construct the Bevels Nos. 1-2, the construction of which are obvious on inspection. The stone may now be worked to the direction given for the similar operation in Plate 14. In Fig. 7 is shown the method of application of the bevels for the purpose of obtaining the proper direction for forming the joint surfaces of the prism; after these are cut, the Bevels Nos. 3-4 give the direction of the plumb lines A-Y and Z-E of the joint sections.

C. H. FOX.



TWO STRIKING MAUSOLEUMS



ESSRS. C. E. TAYNTOR & CO., of New York, have closed the contract for the Chas. Broadway Rouss mausoleum, which is to be erected at Winchester, Va. This is on the Parthenon design, and will be a very handsome building. The firm has also signed a contract with W. Henry Morgan, Mr. and Mrs. W. H. Ramsey and Edwin Morgan, of Alliance, Ohio, for the erection of a magnificent memorial in the cemetery of that town to the memory of the late Hon. T. R. Morgan. After consideration for more than a year, the family decided that the memorial should take the form of a mausoleum. The accepted plans call for a Romanesque tomb, entirely new and original in design, and absolutely unlike

any other monumental structure in the United States. It will be 25 feet in height, 27 feet in width and 20 feet in depth. The main front will have a magnificent arched entrance, with large pilasters on either side. The columns will have a carved serpentine effect at the top after the plan of those seen in some of the famous cathedrals of Europe.

The mausoleum will be surmounted by a large dome. The entire work will consist of enormous blocks of stone, so that it will be practically jointless. It will contain twenty-four catacombs, sealed so that the interior will present the appearance of a chapel. Gold glass mosaic work of ornamental designs will predominate, and the top will be so arranged as to admit light in a manner that will cause a peculiar twilight effect similar to that in the tomb of Napoleon.

An altar will be built, in front of which will be a sarcophagus. Above the altar will be a stained glass window representing the "Angel of the Resurrection." The structure will be built of C. E. Tayntor & Co.'s Barre granite, which is very white. More than 300 tons of granite will be required to complete the mausoleum. Work will be begun at once, and it is expected that the structure will be completed in the autumn.



THE GREATEST GRANITE WORK OF THE CENTURY

HE "Stonemason," of London, has an article on the building of the Assuan dam, that is full of pardonable glorification of the English enterprise that builds it. "The Century Magazine," in a recent number, had a popular account of this work, but the account in the "Stonemason" is worth reprinting. The writer says:

Since the building of the Pyramids, Egypt has seen few such gigantic undertakings as the construction of the great reservoir dam at Assuan, the foundation stone of which was laid a short time ago by the Duke of Connaught.

This dam will be a mile and a quarter in length; the height of the coping-stone will be 300 feet above the bed of the lower river; and for 140 miles Father Nile will feel the influence of this great impounding of waters.

English engineers and English surveyors have planned this great enterprise; English money is at the back of it and English bondholders will next, perhaps, to the cultivators of the soil on the Nile banks, derive the greatest benefit.

Five thousand dusky natives are already at work; one order for 3,000,000 barrels of European cement has been, or is about to be, delivered; thousands of tons of granite ashlar are being quarried from the Assuan side of the river. Never has the ancient river on whose bosom Moses was cradled seen such industry. John Bull has very much arrived.

The dam will be built of material taken from the quarries at Assuan. On its completion, the reservoir will hold 250 billion gallons of water, and across this huge artificial lake a bridge will stretch, and camel trains and

pedestrians will pass over, and all will be life, and bustle, and hurry. Never had the descendants of Pharaoh such a shaking up.

And what is the object of it all? "Egypt is the Nile, and the Nile is Egypt." In that ancient saying the whole business may be summed up. The dam will bottle up the rich Nile waters; millions of acres of land will be irrigated; 2,500 square miles will be reclaimed from the deserts; in short, the dam will increase the country's productive capacity by 25 per cent. Egypt's output of raw sugar will in a year or two be doubled, perhaps trebled.

The work will be completed in a little over five years from now. This is the first time a river approaching the size of the Nile has had a dam built in it. Another novel thing about this altogether novel undertaking is that it will be both a dam and a waterway.

Now, as to the cost. When one considers the stupendous character of the scheme, the many difficulties that will have to be overcome, and the incalculable benefits that will accrue, the price does not appear exorbitant. The contractors are to receive, in round figures, £160,000 a year for thirty years, making in all about £4,800,000.

The period over which this payment is to extend must carry conviction to the minds of other nations who have set longing eyes on the Valley of the Nile that Great Britain means to hold on to it for some time at any rate.



AMERICAN SLATE ABROAD



IN reply to a Pennsylvania firm, Consul General Gowdy, of Paris, writes, on April 11, 1899: Slate is produced in France to a very large extent and is taken from both open and closed quarries.

The best of these quarries are located in the neighborhood of Anger, Department of Maine et Loire. The slate extracted is principally used for roofing tiles; from certain quarries, for large slabs, billiard tables and public toilet rooms.

Under the present conditions, the French tariff on slate coming from the United States is: For slabs, tables (broken or sawn) in the rough or polished, 4 francs (77 cents) per 100 kilograms (220 pounds) gross; for roofing, 1.40 francs (27 cents) per 100 kilograms gross; for framed school slates and for drawing, 5 francs (96 cents) per 100 kilograms.

I give herewith a table of statistics of exports and imports for 1897, being the last official figures on the subject. The terms "special" and "general" mean special commerce and general commerce, defined as follows: In imports, general commerce includes all merchandise of this nature entering France from foreign countries or colonies, whether by land or by sea, and whether intended for consumption in France or for re-exportation or transmission to other countries. Special commerce means all merchandise of this nature subject to duty withdrawn during the year for consumption from the entrepôt (or warehouse) on payment of duty. In the line of exports, general commerce includes merchandise of every description, whether of foreign or

domestic origin, exported from France. The term "special commerce" embraces only merchandise of national origin and that of foreign origin which has been admitted free of duty or has been nationalized by the payment of duties.

Exports.

Description.	Quantity.	Value.
	Met. quint.*	Francs.
Building slabs and tables:		
General	860	19,118
Special	861	18,942
Total	1,730	38,060
Roofing:		
General	485,182	4,124,046
Special	477,357	4,057,552
Total	962,539	8,181,578
Framed school and drawing slates:		
General	9,731	194,630
Special	9,318	186,361
Total	19,049	380,991

* 1 metrical quintal = 2,204.6 pounds.

Imports.

Description.	Quantity.	Value.
	Met. quint.*	Francs.
Building (rough):		
General	2,175	10,875
Special	2,057	10,285
Total	* 4,232	21,160
Slabs and tables:		
General	6,385	127,702
Special	5,595	111,896
Total	† 11,980	239,598
Roofing:		
General	18,988	161,402
Special	11,163	94,888
Total	‡ 30,151	256,290
Framed school slates and drawing:		
General	1,775	35,506
Special	1,418	28,357
Total	§ 3,193	63,863

* Belgium supplies 954 metric quintals; Italy, 1,207.

† Italy supplies 5,336 metric quintals; Germany, 215; England, 214; Belgium, 169; United States, 161.

‡ From England and Belgium.

§ From Germany and Switzerland.

SLATE IN BELGIUM.

In reply to a Pennsylvania correspondent (to whom the original letter has been forwarded), Consul Le Bert writes from Ghent, April 25, 1899, in part as follows:

In this district, which comprises East and West Flanders, slate is not manufactured for any purpose and is used only for roofing. All public buildings—Government, municipal, churches, theatres, schools, etc.—have for the past twenty-five years been roofed with slate. Its use on stores, residences, etc., does not date back quite that far. It is only within the past eight years that it has been generally employed, and it is now rapidly gaining favor as a roofing material. To-day, few buildings of the better class are constructed without slate roofs. Wood shingles are unknown; the prevailing material has been clay tiling. This is very cheap, and the poorer classes of buildings will probably be roofed with tiling for many years.

Slate blackboards are little used; wooden boards appear to give satisfaction. Slate mantels are unknown; granite and marble are said to be cheaper, more durable, and capable of better finish. Slate floor tiles are not used. School slates are manufactured in Belgium, and are also imported from Germany.

The following tables will show the trade in slate in 1897, the latest year for which statistics are available:

Importation of roofing slate, 1897.

Country.	Pieces.	Value.
England	338,700	\$1,372.81
France	37,251,683	150,981.01
Grand Duchy of Luxembourg	1,105,400	4,480.10
Other countries	57,725	234.11
<hr/>		
Total	38,753,508	157,068.03

Exportation of roofing slate, 1897.

Country.	Pieces.	Value.
Germany	8,894,620	\$68,666.50
England	373,885	2,886.31
Austria	71,000	548.12
France	670,250	5,174.33
Grand Duchy of Luxembourg	4,307,870	33,256.79
Holland	668,346	5,159.66
Switzerland	2,024,570	15,629.53
Other countries	293,020	2,262.15
<hr/>		
Total	17,303,561	133,583.39

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Production of slate in Belgium.

Locality.	Pieces.	1897.		1896.	
		In cubic meters (35.316 cubic feet).	Value.	Pieces.	Value.
Namur	4,740,000	.....	\$319,279.90	35,980,000	\$255,242.50
Luxemb'g	36,682,000	.....	4,747.80	1,150	4,825.00
Do. . . . .	.....	1,445	.....	.....	.....
Total	41,422,000	1,445	324,027.70	35,981,150	260,067.50

Recapitulation of roofing slate imported, exported, and produced for year '97.

Description.	Pieces.	Value.
Importation	38,753,508	\$157,068.03
Production	41,422,000	319,279.90
Total	80,175,508	476,347.93
Less exportation	17,303,561	133,583.39
Surplus.	62,871,947	342,764.54

The duty on slate is 77 cents per 1,000 pieces. Prices obtained by contractors are from 67.55 to 86.85 per square meter (10.76 square feet), according to quality, laid on roof.

The principal dealers in slate in Ghent are: P. Van den Heede, Rue Basse No. 20; E. De Bruyn, Ledeberg; G. Casteleyn, Digue des Blanchisseurs No. 10.

SLATE IN BOHEMIA.

Consul Hugo Donzelmann, writing from Prague, April 14, 1899, says: Slate is another article for which there is a market. It is produced in Bohemia in very small quantities and in two colors only—blue and green. It is used for roofing purposes, but the production does not nearly supply the demand. The slate used is in the form of rectangles and hexagons, the sizes being from 12 by 6 to 21 by 11 inches, and so far, the demand has been principally supplied from England, some also coming from France, Germany and Switzerland. The last two countries send school slates as well. The first four carloads of American slate were brought here a few days ago through the firm of Josef Umlant & Co., in Bodenbach, Bohemia. So far as this market is concerned, our exporters have shown a certain apathy, possibly the result of the immense development of our exports during the last two years. This very extension of our trade will cause increased activity on the part of foreign manufacturers, and our exporters should cover every field possible and establish themselves firmly. It is conceded on all sides that American articles are superior to others of like kind; and, once the people in foreign countries are accustomed to use them, it will not be easy to introduce other goods, even though these may be a trifle cheaper.

Comment on Timely Topics

A PLEA FOR STONE BRIDGES

IN the March number of *STONE* there was printed a statement by Alderman William Hall, of Des Moines, Iowa, giving arguments in favor of stone rather than steel bridges. There is undoubtedly a growing feeling in favor of stone bridges in various parts of the country. "The Messenger," of Eureka, Kan., declares that the stone arch bridge is one of the coming things in Kansas. Butler County in that State has a number of them, and they give complete satisfaction. It is a pleasure to reprint the following eloquent appeal of the "Walnut Valley Times":

"One of the most picturesque features of the country landscape is the stone bridge. In Europe stone bridges are used exclusively on country roads, and in the old Eastern States they largely outnumber those built of iron. In the West, however, and especially in the prairie States, where there is no stone save that which is imported, the skeleton iron bridge is used to span the streams. But, like most things built exclusively for utility, the iron bridge is not beautiful.

"There is no reason why the useful should not be beautiful as well, and the stone bridge is both. In the New England States there are bridges, vine-covered and beautiful, that were built many years ago, and the rigors of the climate have left them sound, the weather only increasing their beauty year by year. Some of the bridges in the old New England towns date from Revolutionary days and, having been repaired from time to time, are as useful as they were when first built.

"The iron bridge is cheaper when first put up than is a stone bridge, especially when built in a country where stone is scarce, but the stone bridge when properly constructed, is practically imperishable, while the iron bridge must be constantly repaired and painted and wears out in a few years. The iron gets loose and rattles, bolts rust out and the wooden floor must be renewed every year or two. The last quality of the stone bridge is not conjectural. The bridges and aqueducts of Rome prove this and there are stone structures of this kind in Southern Europe that are 2,000 years old. In the mountain districts of Spain are stone bridges that have spanned the chasms for centuries. There is hardly a limit to the size of stone bridges, and there is not a country stream that could not be bridged with stone. One of the famous stone bridges of the world spans the Allier River in France at Vielle-Brioude. It has a span of 183 feet and a rise of 60 feet. The stone

bridge over the River Dee at Chester, England, has a 200-foot span and a rise of 42 feet.

"The iron bridge, besides being less beautiful, is not nearly as safe or as lasting as that built of stone. The Pennsylvania and New York Central railroad systems not long ago decided to take out iron bridges and substitute those built of stone along their entire lines. This change was not on the account of the superior beauty of the stone bridges, but because of the economy of their great durability. This rule applied to all culverts and bridges small enough to be built of stone."

There is no word of exaggeration in this, and it is to be hoped that the sentiments expressed will meet with general acceptance. Utilitarianism is one of the most striking traits of Americans, and to it they probably owe a large part of the rapid growth and prosperity that marks the country. It is hardly to be expected that stone bridges will ever replace the huge iron spans over large rivers, but there is no reason, whatever, why stone should not be used for most of the smaller structures. It would add to the picturesque of the country, and in the matter of financial cost, where durability is one of the principal factors, the results would undoubtedly be satisfactory. When one remembers the series of pictures of stone bridges of all ages and countries that STONE has published during the past few years, and contrasting these with the rude lattices of steel and iron, one can see what a vast field there is for improvement.

AN ENGLISH VIEW OF THE MARBLE FIELD

THE "Stonemason," of Bristol, England, in its current number has quite a little editorial comment on the situation in the marble field.

This is apropos of the Anglo-Carrara Marble Company, concerning which an article will be found in another column of this issue of STONE. The article, from "The Quarries and Builders' Merchant," was written upon the announcement of the formation of this company, and the "Stonemason" announces its demise almost as soon as its birth. Immediately upon the issuance of the prospectus, a conflict began between the Chamber of Commerce at Carrara, and the promoters, as to the output of the quarries proposed to be purchased. This prevented any public support of the scheme, and the directors decided to drop the whole matter at once. As the "Stonemason" remarks, the interests in the Italian quarries are very divergent, and until these can be harmonized, there is little chance for combination in this field.

The same paper notes the success of the Bentelicus Marble Quarries Co., which has bought up some quarries on the north side of the Grecian mountain. It is reported that the company is employing about 300 laborers, and that the price of the marble is about \$20 a ton f. o. b. The output goes almost wholly to the Greek market, and it is not likely that it will ever supply more than the local demand.

After commenting on these two ventures, the "Stonemason" says, that if marble were only employed in the Old World in as lavish a way as it is in America, there would be a profitable field for the investor in the marble quar-

ries. Even the newspapers in the United States are being located in marble palaces, and then it gives a detailed account of the magnificent new building of the "Washington Star." The writer adds: "Nor is it alone in marble work that our American cousins have extensive ideas. It is stated that in the Chicago post office building there are to be put sixteen fluted granite columns, four on each front, and according to the dimensions, given by the architect, each column will weigh about 80 tons when it is finished. According to the same authority, the caps and bases for these columns will weigh nearly 30 tons. This is doing business on a grand scale indeed." The "Stonemason" ends with a deserved tribute to the work of our Geological Survey. It says. "To come down to ordinary work-a-day matter of fact, there is one matter in connection with which the stone trade in America possesses advantages far and away in excess of those enjoyed on this side of the Atlantic. The admirable Government returns with regard to the quarrying industry in the United States leave nothing to be desired."

THE OLDEST BRICK IN EXISTENCE

AT one of the recent meetings of the Académie des Inscriptions et Belles-Lettres, in Paris, the keeper of the Louvre, Mr. Henzey, showed a brick which is undoubtedly the oldest in existence, dating, it is estimated, from the fortieth century, B. C. The brick in question was discovered by the French savant and antiquarian, de Sarzee, during recent excavations at Tello, the ancient Sirpulo in Chaldea.

The brick was somewhat curved, and had been baked, but was of such crude form that it evidently had neither been put in a press nor moulded. The mark of the maker was simply the imprint of the thumb. It was clearly made very soon after the discovery of the art of brickmaking, which art, as is universally admitted, marks the dawn of civilization.

Other bricks of a much more recent date were shown. Some of them bore the mark of the coat of arms of Sirpulo, an eagle with the head of a lion. Others again were inscribed with the name of the reigning monarch.





A company composed of residents of Denison, Texas, and business men from the Indian Territory, has been organized to work the granite quarries near Tishomingo, I. T.

Fifty men and twenty-five teams are employed in the crushed stone quarries of Messrs. Newall & Ackerman, at Cedar Creek, Neb.

The McClenahan & Bro. Granite Company, of Port Deposit, Md., has opened a large stone quarry on the Northern Central Railway, north of the Woodberry station, for the purpose of furnishing stone ballast for the Pennsylvania railway, to be used on the Baltimore & Potomac branch. The plant is now in full operation and is crushing an average of 500 tons a day. Mr. Robert E. McClenahan, Jr., has charge of the quarry, with Mr. George B. Ponton, as foreman.

The Corryton (Tenn.) rock quarry is running with a full force, shipping rock to Middlesboro.

The four quarries at Stonewall, Manitoba, are all running to their full capacity. They are operated by Messrs. Gunn, Paterson Bros., Williams, and Fullbrooks.

William Adams has opened a large stone quarry at Chimney Rock, Minneiska, Minn. He will supply rock to the government.

The Kankakee quarries, Kankakee, Ill., have raised the price of crushed stone from 75 to 85 cents per yard.

About 600 quarrymen in Illinois have received an advance of wages of 25 cents a day. This affects the employees of the Western Stone Company, operating at Lemont, Lockport and Joliet. The Joliet Limestone Company, and several other

concerns, employing about 400 men, will make a similar advance.

While quarrying stone near Shelbyville, Ill., several men came across mineral that assayed from \$5 to \$7 a ton in gold.

Kankakee, Ill., has just purchased machinery for the city quarry.

The stone quarry at East Moline, Ill., has just been opened.

The Milford Granite Company has opened a new quarry on its land near what was once Miller & Luce's quarry at Milford, N. H. The stone is said to be of a superior quality.

William Koehnline, proprietor of the Avondale stone quarry, at Martin's Ferry, W. Va., has increased the wages of all of his employees.

The Viernow-Meysenberg Quarry & Cut Stone Co. has been incorporated at St. Louis by Clementine Meysenberg, Felix T. Meysenberg, Gustav M. Viernow and Philip G. Anton. Capital stock, \$25,000.

The Shailerville Quarry Company, of Essex, Conn., is running full time with a large force of help. It has received a contract to furnish stone for a sea wall to be built at Saybrook Point.

Joseph Avey has leased his stone quarry at Mount Morris, Ill., to Chris. Hefler and William Holsinger.

The limestone quarry on the farm of Emil Uehling, town of Shields, Wis., has been purchased by P. J. Euper & Co. A crusher will be put in, and stone quarried for street improvement purposes.

The firm of Cornwall & Willard, of Cloverport, Ky., has secured a contract for furnishing the city of Cincinnati with stone to be used in the masonry work of a new

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water works reservoir. The amount involved in the contract is \$1,080,000. About fifty men already are at work in the quarries taking out stone for a bridge to be erected at Peoria, Ill. The present contract will furnish work for 100 men for four months.

Head Harbor Island granite quarries at Machias, Me., have been shut down for several weeks. They will open again about the first of July.

Charles Piquett and Matt Bruner have opened up the McDonald quarry, at Burton, Wis.

The Republic Iron & Steel Co. has taken charge of the properties of the Pioneer Mining & Manufacturing Co., at Birmingham, Ala., including a stone quarry.

James Grant & Co. has leased the Finnerty quarry at Pratts, N. H., and are getting out paving and curb stone.

Dwelling houses for employees have been erected at the government quarry at LaMoile, Minn.

H. M. Carter has opened a quarry at Hamilton, Ill., and is shipping ballast and rock.

H. B. Stamps has purchased the old Rogers quarry at Mooresburg, Tenn., and is operating it under the name of the Crescent quarry. He has put in an extensive outfit of machinery, and is getting out a large quantity of marble, some of which will be used in the interior of the new postoffice building at Washington.

Daniel F. Leonard is building at his quarry at Gwynn's Falls, and West Baltimore, Md., a new crushing plant, which will cost in the vicinity of \$25,000. The improved plant will be one of the largest in Maryland. Mr. Leonard has recently bought a quarry of "nigger-head" stone near Wetheredville for \$5,000.

The granite quarry near Big Falls, Wis., has started up again.

The Herrick quarry at Brookville, Me., has renewed operations.

A large rock quarry is to be opened at Glencoe, Ala.

Hon. Wm. T. Cobb, of Rockland, Me., has purchased a three-fourths' interest in the so-called Blackington Farm Limestone quarry, in Knox county, Me. The remaining quarter is in the possession of the heirs of the late Timothy Williams.

The quarrying industry at Stonington, Me., is flourishing at present. There are

about eight quarries in operation at Crotch Island, one at Moose Island, two at Green Island, one at St. Helena, and four in the village of Stonington, making sixteen now operating in the one town.

There is a likelihood that the quarry at Freeport, Me., formerly owned by E. B. Mallett, and known as the Freeport Granite quarry, will be put in operation again. When the quarry was sold at auction last fall it was bid in by Wm. Moyes, of Freeport, at a low figure. Pittsburg (Pa.) parties are now talking of forming a stock company to work the quarries. The granite is favorably known in various parts of the country, large quantities having been shipped to the Western States. Much of it has also been used in Chicago.

Work has been commenced at the Fullerton stone quarries, south of Princeton, Ind. Dr. F. R. Fullerton, the manager, has secured contracts for furnishing the Rock Island Railroad company with 750 carloads of dimension stone.

The Plymouth (O.) stone quarry has contracts for getting out stone for most of the B. & O. bridges to be widened by the double-tracking of that line.

The city officials of St. Paul have inspected the new quarries at Mantorville, Minn., with the idea of using the stone for public construction in that city in the future.

The stone quarry on the farm of George W. Berry, near Rosby's Rock, W. Va., has been opened this season, and is being rapidly worked.

Thomas Bittles, formerly connected with the Porter Stone Company, at Joliet, Ill., has resumed his position as superintendent of the quarries.

Obtaining Title to Minerals by Adverse Possession

Coal and minerals in place, the title to which has been severed from the title to the surface, constitute "land," within the meaning of a law providing that, whenever a person having color of title made in good faith to vacant and unoccupied land, shall pay all taxes legally assessed thereon for a certain number of years, he shall be adjudged the legal owner, etc.—Catlin Coal Company vs. Lloyd (52 Northeastern Reporter, 144): Supreme Court of Illinois.



Stone Trade Notes



Detroit will lay a sample block of macadam on Pitt street, obtaining the stone from the Anderson quarry. A twelve ton steam roller has been obtained on trial and if the macadamizing proves successful it will be extensively adopted in the city.

Messrs. A. J. Beckley & Company, of Garwood, N. J., have completed arrangements for supplying towns, cities, villages and contractors with complete stone crushing and screening plants, operated until accepted.

Muskegon, Mich., is to have a new industry. It is to be a factory for the making of a combination dray and stone boat.

Rochester, Minn., has just installed a new Austin & Western stone crusher. The first day of its operations the town crushed 100 loads of stone.

Calaway County, Mo., is agitating for stone roads.

The De Graff & Roberts Cut Stone Company has been incorporated in Erie County, N. Y. The directors are: James A. Roberts, former State Comptroller; James H. De Graff, Tonawanda, and Lewis A. De Graff, of Albion. The company has a capital stock of \$20,000, and will carry on a business of quarrying and dressing stone in the quarries near Albion.

S. T. Runnels has leased a stone mill at the Bedford, Ind., Stone Company's quarry and will operate it.

Antwerp, N. Y., has purchased a Climax stone crusher and is crushing granite for road making.

A newspaper item says: "Buffalo, N. Y., has a woman contractor who is also a quarry owner. She is the only woman member of the Builders' Exchange."

The Louisville Stonecutters' Union has come to an amicable understanding with the Barber Asphalt Company and other leading contractors. The union agrees to dress all kinds of stone at prices that are satisfactory to each. The understanding was largely brought about by the Mayor

and Board of Public Works. The city has contracted for an immense amount of stone work, calling for over 10,000 feet of curbing.

The Le Claire (Ia.) Stone Co., H. H. Martin, of Moline, manager, has been awarded the contract to furnish rock for Government works on the dams between Le Claire and Davenport. Two thousand five hundred yards is the first order, to be furnished as fast as it can be quarried, loaded and shipped.

La Crosse, Wis., will give a trial to Winona stone for curbing.

Oconto, Wis., has purchased a new stone crusher and will improve its roads.

Madison, Wis., will receive proposals for furnishing the city crushed stone from the city quarries, using the crushing machinery now owned by the city, or putting in a new outfit to be furnished by the city.

The Lamar, Mo., Sandstone Co., capital stock \$2,000, has been incorporated by E. H. Adams, T. A. Perry, E. A. Stone and others.

The Millington, Ill., White Sand Co., has been reorganized on a sound financial basis, and will be ready to begin business about the middle of August. Superintendent A. E. Browne is in charge.

The Winona, Minn., city council is seriously considering the purchase of the historic Sugar Loaf Bluff, the refuse stone, of which there are many thousand tons, to be used in macadamizing streets.

The Clydesdale Stone Company, of Allegheny, Pa., has been incorporated. Capital, \$30,000.

Frank Bradbury, of the West Franklin, Me., quarries, has contracted with the city of Salem, Mass., for 100,000 paving blocks.

Lincoln Park, Chicago, is to add to one of its fountains four grotesque gargoyle taken from the Hotel Iturbide, in the City of Mexico. They are six feet high and a foot and a half thick, and are quaintly carved from solid blocks of limestone of

STONE.

the Valley of Mexico. The building from which they were taken was built in the latter part of the last century by the widow of the Marquis de San Matee Valpariso, famous in the history of Mexico as a politician, soldier and promoter. The building has just been remodeled and the gargoyles were secured for Chicago by an enterprising traveler.

A deal has been made completing the limestone combination in Blair County, Pa., three-fourths of the capital stock of which is held by the Carnegie Steel Company, Ltd. The Clover Creek Limestone Co., which was owned by Cleveland capitalists, has been merged into the combine with the Pittsburg Limestone Company, which is managed by the Carnegie people, thus controlling 90 per cent. of the stone of this kind used in that county. The new combination owns extensive quarries at Clover Creek and Franklin Forge, Blair County. They will take out 125 carloads of limestone per day, thus giving employment to 500 men. Operations to be begun about July 1.

The New Jersey Supreme Court has rendered a decision in favor of the New York Trap Rock Company in its suit against Brown & Fleming. About two years ago a trust was formed. Several quarries were closed, and prices were advanced. A part of the agreement was that only the agent of the trust could sell the stone, and a penalty of \$5,000 was prescribed for violating this clause of the contract. There was some dissatisfaction and Brown & Fleming accepted an order for a large quantity of stone. The trust instituted suit to recover the penalty of \$5,000. Brown & Fleming filed a demurrer, setting forth that by the declaration of the plaintiff the company admitted that it was a trust, and that it was an illegal combination, formed for the purpose of destroying competition and to control the price of rock. The Supreme Court overruled the demurrer, holding that a contract that a single person shall be employed as the sole agent of the manufacturers to sell all their output does not violate any principle of law and may be enforced.

A. E. King has established a business as a general stone contractor at Galesburg, Ill.

A Famous Old Prison to Go.

The prison of Sainte Pelagie on the Rue du Puits de l'Hermite, Paris, is to be demolished. A few weeks ago the privilege of doing the work and acquiring the materials was set up for sale by auction, but as the starting price was not to be less than 17,000 francs, no house-breaker was discovered with sufficient enterprise to offer that sum. It will be necessary for the authorities to make a large reduction of the amount demanded. The building was originally a convent, founded in 1665. At the time of the Revolution it was utilized as a prison for the suspected men and women who were considered enemies to the Republic. It was, in fact, a resting-place on the way to the guillotine. Madame Roland remained in it long enough to write her Memoirs. At a subsequent period a part was used for condemned criminals and a part for political offenders. Many distinguished French authors have been confined in it. Anything which could be considered as possessing historical interest has been reserved by the authorities, including doors of cells tenanted by notabilities, and windows on which they had scratched their names. The prison retained many of the expedients which were supposed in old days to be efficacious in reforming culprits or for moving them to repentance.

Last Year's Mineral Production of Quebec

Mr. Obalski, inspector of mines, has issued a statement of the production of minerals in the province last year. The total value was \$1,673,337, of which bricks alone represent a value of \$600,000 and lime of \$140,000. About \$500,000 worth of asbestos was mined and \$200,000 worth of copper. This leaves about \$200,000 worth of iron ore, gold, mica, chrome ore and slate. Phosphate mining, once so important an industry, has declined until at the present time it amounts to very little. The discovery of the more easily soluble phosphates of Florida and Tennessee has hampered the development of the Canadian phosphates, which for the most part are crystallized apatite, high in phosphoric acid but difficult of treatment.



Monumental News



Rome, N. Y., has decided to raise \$10,000 for a soldiers' monument.

The Missouri Legislature has appropriated \$500 for a monument over the grave of United States Senator James S. Greene, at Canton, Lewis county.

Danville, N. Y., will have a \$3,300 soldiers' monument.

The Minnesota Valley Historical Society will erect a monument to commemorate the service of the Indians who alarmed the whites of the approach of hostile members of their tribe during the massacre of 1862.

Gaddess Bros., of Baltimore, have been awarded the contract for a Confederate monument to be erected on the eastern shore of Virginia.

The Southern Theological Seminary will erect a monument in honor of the late Dr. Broadus, at Louisville, Ky.

The State of Washington is raising fund for a soldiers' monument. The general impression is that it shall be located at Olympia.

Southern people are confident that a "Battle Abbey of the South" will be erected at Richmond, Va. The proposed cost is \$200,000, of which Charles Broadway Rouss has promised to contribute \$100,000.

A monument to Gov. Simeon will be erected in front of the Ontario Government buildings at Ottawa.

The sum of \$20,000 has already been raised for a statue to the Polish patriot, Kosciusko, to be erected in Lincoln Park, Chicago.

The American Society of Mechanical Engineers is discussing a project of erecting a monument or tablet in memory of Robert Fulton, the builder of the first steamboat, who is buried in Trinity Churchyard, New York.

The City of Winona, Minn., is raising funds for a statue of the beautiful Indian maiden, after whom the city is named.

The Alexandria (Va.) marble works have been awarded the contract for a monu-

ment to the memory of the Confederate dead at Edgefield, S. C. The pedestal will be of dark Barre granite, surmounted by a bronze figure representing a Confederate infantryman.

A beautiful fountain in the form of a statue representing an Indian medicine man, a panther and a deer, designed by Edward Kemps, has been dedicated in Champaign, Ill. It is the gift of the late B. F. Johnson to that city.

The statue of Chief Oshkosh, a full-blooded Menominee Indian, after whom the City of Oshkosh was named, will be placed in the public library at that city.

Walla Walla, Wash., is raising a fund for a monument to the volunteers in the Spanish-American war.

James Netherwood, the greatest monument builder in the South, is dead at Richmond, Va. He was a native of Yorkshire, England.

A Confederate monument was unveiled at Chatham, Va., on June 8.

In accordance with his dying wish, the monument erected over the grave of Volrath Moehle, the village blacksmith at Bellville, Ill., consists of his anvil, coated with enamel, topped with a large horseshoe, and set in a base of solid granite.

N. B. Forrest Camp, of Chattanooga, Tenn., is inaugurating a movement for a monument to the heroic women of the South during the rebellion.

Yamhill county, Ore., will erect a \$2,500 monument to its soldiers who died in the Philippines.

Vincennes, Ind., will endeavor to erect a monument on Sugar Loaf Hill to George Rogers Clark, the explorer.

The fund for a statue in memory of the late H. S. White, the volunteer fireman, of Syracuse, is nearly completed. About \$10,000 has already been raised.

Prof. Bachmann, the sculptor, has designed a life size figure of Grief for the monument in Kensico cemetery, in memory of those who perished by the Windsor

Hotel fire. The New England Monument Company will erect the monument proper, which will consist of three granite columns. One will be completed, to represent those who escaped from the fire, one partly broken, to represent the identified dead, and one broken at the base to represent those unidentified.

The Evening News, of Calumet, Mich., has started to raise a fund of \$5,000 for the dead heroes of the late war.

Morrisville, N. J., is raising funds for a soldiers' monument.

The monument to Justus Rathbone, founder of the Knights of Pythias, will be unveiled at Utica, N. Y., July 27.

The friends of Magill College, at Montreal, are talking of raising a shaft on the grounds of that institution in honor of Sir William Dawson.

Mrs. Florence Steele Vance is president of the Robert E. Lee Monument Association of the District of Columbia, which proposes to erect a monument or an equestrian statue to Gen. Robert E. Lee, at Fort Myer Heights.

Heroic statues of Col. James Mulligan and Col. Elmer Ellsworth have been presented to the old soldiers of Illinois, and will be placed in Memorial Hall, Chicago.

A bust of Tom Paine was unveiled at his grave in New Rochelle last month, and the first night after the ceremonies it was chipped by vandals.

The monument in honor of David Barton, Missouri's first senator, at Boonville, will be moved from that place to Columbia, where it will be placed beside the monument of Thomas Jefferson in the university campus.

Gov. Roosevelt made the address at the unveiling of the Frederick Douglass statue in Rochester, June 9. The statue is in bronze, mounted on a foundation of marble, and the total cost was \$7,000.

Watertown, S. D., will erect a \$1,000 monument in Court House Square, in honor of its soldiers killed in the Philippines.

Messrs. Empey & Cameron, of Algoma, Wis., have completed a \$2,500 monument in honor of the soldier dead of the rebellion and the Spanish-American war, at Keweenaw, Wis.

Mr. and Mrs. R. E. Lewis, of Watertown, Wis., donated a soldiers' monument to that city, and it has just been completed.

It was built by J. J. Anche & Sons, of Watertown, is of Barre granite, 50 feet in height, and cost \$6,000.

It is to be expected that Dewey monuments will be planned for all parts of the country. The first two cities in the field are San Francisco and Chicago, each of which is trying to raise \$100,000 for a suitable memorial.

The P. M. Peterson Granite Company has erected a cenotaph over the grave of Private Robert B. Sinclair, at Oakland cemetery, St. Paul. Private Sinclair was a member of Company L, Twelfth Regiment of Minnesota Volunteers, and was the first man to fall in the volunteer service, and undoubtedly the first in the United States to lose his life in the war with Spain.

The Scandinavians of Minneapolis will hold a great picnic on June 24, to raise money for a monument to be erected in honor of John Ericsson.

The plan of Worden Bros., of Dansville, N. Y., has been accepted for a soldiers' monument to be erected by the Seth N. Hedges Post, G. A. R., of that village. The monument will be 31 feet in height, built of gray Barre granite. The estimated cost is \$4,000.

The Misho Manufacturing Company, of Sauk Rapids, Minn., has completed a fifteen-ton monument for Lakewood Cemetery, Minneapolis.

F. E. Leimer, a Chicago sculptor, has been selected to make a bust of President McKinley for the Government Building at the Paris Exposition.

The contract for the soldiers' monument which Z. G. Simmons is to donate to Kenosha, Wis., has been awarded to the W. H. Morse Company, of that place. The monument was designed by D. H. Burnham, a Chicago architect, and it is said that it will cost over \$15,000. It will be made from Barre granite.

The finest private monument in the State of Indiana is said to be the one built over the grave of Robert Anderson, at Fort Branch. The reason for its erection is said to have been because Anderson was disinherited for being a Jacksonian Democrat. His father did not like his political beliefs, and cut him off with \$5, although he left the other heirs rich legacies. He refused to take the \$5 and made a fortune of his own. Determined that none

of his relatives should benefit by his wealth he made his wife promise him on his deathbed to erect the finest and costliest monument in the State over his grave. This is now completed. It is of the finest Italian marble and represents Mr. Anderson and his wife in life size. The base is of polished Italian Marble.

The bid of Bruno Schmitz for the bronze work, at \$33,000, for the Indianapolis soldiers' monument, has been accepted and the work will be done in Germany. The bid of Rudolph Schwartz for the four figures representing the different branches of the service, at \$10,800, has been accepted. The figures will be cut of Bedford stone, and will be fourteen feet in height.

The monument to the late Rev. Dr. Thomas Railey Markham, who was a chaplain in the Confederate army, has been dedicated in Metairie Cemetery, New Orleans. It was designed and built by Albert Weiblen, of New Orleans, and has a shaft having a total height, including the base, of thirty-seven and one-half feet.

Thomas Jardine & Sons, of Rahway, have erected a handsome monument of Quincy granite in the cemetery at that place. It is surmounted by a life-size figure of Italian marble.

A monument to the Federal dead of Tennessee will be erected in the National Cemetery at Knoxville.

A \$2,500 Confederate monument will be erected at Franklin, Tenn.

The Donegal Chapter, Daughters of the Revolution, of Lancaster County, Pa., recently purchased of the Preston Blue Stone Company, at Rowlesburg, W. Va., sufficient stone to erect a monument on the burial ground connected with the church bearing the name of their chapter, and located at Donegal, near Columbia, Pa. A Malnatti, of Washington, D. C., is to do the work for them.

Efforts are being made in New York, Philadelphia and Boston to raise \$1,000 for each city towards the statue of Rochambeau, who commanded the allied French force in the Revolution, to be erected at Vendome, France.

J. D. Shelton, of Nashville, Tenn., has secured a contract for a Confederate monument to be placed in Cedar Grove Cemetery, Tenn. It is to be 17 feet high, and will be made from Bedford limestone.

Strange Machine Terms

There are, perhaps, few except those who have had much translating of technical literature from English into foreign languages who have any idea of how many absolutely meaningless names we have drawn from the animal kingdom, and which very seldom can be rendered in their technical sense by their actual equivalent, writes R. Grimshaw.

Thus the machinist employs a "dog" on his lathe; he takes a "hog" cut, if the tool will stand it; the castings are made from "pigs" of iron, which in turn were fed from a "sow." Work is set upon a "horse" or "buck," and punched or bent by a convenient "bear;" screws are turned by a "monkey" wrench. Hoisting is done by a "crab," and a convenient "cat" is a part of the outfit of a shop "crane," and a "kit" of tools is ever at hand. A "crow" helps to straighten work, a "jack" to lift it, a "mule" pulley aids in driving machinery that a "donkey" engine turns. A "fish" connects parts end to end, or strengthens a broken beam; "shells" are used all over; a "worm" does powerful but quiet work. A "cock" shuts off the water; one kind of a "ram" raises it and another does heavy work. A printing press has a "fly;" the first locomotives had a "grasshopper" valve motion and drive, and "butterfly" valves are common. "Herring bone" gears are used by the best builders; "turtles" fit printing-press cylinders, and "fly" wheels are running all over the world. In drilling, even an "old man" is called into service, and "doctors" prevent faulty lathe work.

But from the human body itself we borrow the name of nearly every principal part, as head, neck and chest, arm, leg and toe; heel, sole and foot; elbow, shoulder, wrist and knee; knuckle and finger; rib and diaphragm; eye, ear, nose and cheek, mouth, tongue and tooth; throat and gullet; back, side and belly.

From the minor animals also we get snout and horn, tail and claw, wing and feather, quill and spur, fine and scale. Exasperating to foreigners learning our technical terms.

A shaft is to be erected in honor of the Confederate dead at Massanutton Cemetery, Baltimore.

Marble and Granite

Andrew Hodsdon, the oldest male resident of Pownal, Me., is dead, at the age of 88 years. Mr. Hodsdon formerly did considerable quarrying of granite.

The Atlanta Constitution says: The Kennesaw Marble Company, of Marietta, Ga., the company who furnished the beautiful marble work in the Prudential building in this city, have one of the largest and most complete plants in this country for furnishing marble. In addition to the large amounts of Georgia marble, the finishing of which they make a specialty, they are the largest importers of Italian marble in blocks in the Southern States. The company employs 100 men at its mills near Marietta, and these mills are run night and day to their full capacity. The officers of the company are R. W. Boone, president; who is also president of the First National bank, Marietta, Ga.; S. C. Tate, vice-president; one of the owners of the properties on which Georgia marble is quarried, and George F. Newell, general manager and treasurer.

The Freeport (Ill.) Marble and Granite Works, under the direction of Messrs. Schadle and Franz, has largely increased its business. The firm has an extensive plant fully equipped with machinery.

The Keystone Granite Company, of Pacolet, S. C., has been awarded a contract to furnish 368,000 Belgian blocks to the City of Athens, Ga.

The Canadian Granite Company, Alexander McLean, president, of Ottawa, Can., has closed up its affairs. Mr. S. Kirby, the secretary, is the liquidator.

James E. Summers has incorporated the Summers Marble Company, of Lynchburg Va., with a capital stock of not less than \$200,000 and not more than \$300,000.

The stone crushing plant on Main street, Minneapolis, now the property of the park board, is busy crushing granite for the improvement of Hennepin avenue, on Lowry Hill. This is the first time that the board has tried broken granite for parkways, and the city authorities are much interested

in the experiment. The works are in charge of J. M. Hazen, former owner of the plant, and are crushing four carloads a day. All of the by-products, including the sizes too small for use on the roads, are sold, thus reducing the cost to the authorities.

The granite firm of Anderson & Fowlie, at Barre, Vt., has been dissolved, the latter taking charge of the business.

The Hallowell Granite Company, which has been awarded the contract for the stone work for the Monmouth (Me.) Town Hall, has sublet the mason work to L. H. Haines.

Mr. Johnson, of Limerick, Me., who lost his marble works by fire last winter, has opened a new shop on Main street.

The Tucson (Ariz.) Marble Works are manufacturing monuments from stone from its own granite and marble quarries, located in the Santa Ritas. From these quarries are obtained black, blue, variegated and white marbles.

A granite quarry has been opened on the Augusta (Me.) Insane Hospital Farm. A new stone crusher is to be purchased and the quarry is to be fitted out so that a large quantity of stone can be crushed for road building purposes.

C. E. Tayntor & Co., the other day, shipped from Barre, Vt., to one place nine carloads of granite, or 280,450 pounds.

C. J. Crosby, representing the New England Granite Company, of Barre, Vt., has purchased a one-half interest in Andrew Hynne's marble and granite business, at 321 Jay street, La Crosse, Wis., and the new firm will be known as Hynne & Crosby.

The stoneyard of Rawnsley & Oglesby, at Chester, Pa., will be made a distributing point for Pennsylvania of the new granite now being quarried at Winsboro, S. C., which is being worked by a company of capitalists.

A company composed of C. D. Welch, Boston, president; J. B. Dyer, Concord, secretary; I. M. Ricker, Groton, treasurer; with a capital stock of \$250,000, has been

formed to develop the Pine Mountain granite quarry, near Groton, Vt. It is expected that the railroad will be built to the quarry. The company reports that the granite is very high in quality.

The Rhode Island Assembly has refused to investigate further the claims of the contractors for the construction of the Woonsocket courthouse. The contention of the contractors is that under order of the architect and with the approval of the commission they substituted higher priced granite than the contract called for, doing so on the promise of adequate extra compensation.

The Columbian Marble Company is hauling marble from East Monkton to Bristol for shipment. The first carload was received this month. The marble is of fine quality, resembling onyx in appearance.

The Pleasant River Granite Company is talking of removing its plant back to Addison Point, Me., owing to the excellent shipping facilities at that place.

The new Government building at Helena, Mont., is to be three stories in height and will be built of granite at a cost of \$300,000.

An effort will soon be made to develop a cropping of black marble a few miles south of Maryville, Tenn.

The Underwood Marble Works, at Staples, Minn., has been destroyed by fire.

The Natal Marbles

A company having been floated with a capital of £150,000 to acquire Mr. J. B. Aiken's extensive marble beds, a promising little industry is likely to spring up which will benefit Port Shepstone considerably and doubtless hasten the construction of the Port Rynnie Railway line, says "Machinery," of Johannesburg, South Africa. We are not aware of the exact amount of cash which has been set aside for working capital, but we have little doubt that Mr. Aiken has made suitable provision. It has been decided to turn out eighty tons a day of commercial marble, and suitable machinery will be purchased for quarrying and cutting up the stone. This machinery, the most modern obtainable, has been ordered from London and New York. The company which will open up these vast marble beds comprises a number of re-

sponsible gentlemen whose influence will insure the success of the venture, and Mr. R. K. Loveday, the First Raad member for Barberton, heads the list. According to Mr. Loveday the marble is of exceptionally good quality, a considerable portion of it being whiter than the famous Carrara. Furthermore, owing to the absence of frost, the marble is not subject to the extremes of temperature which cause the marble of Europe to fracture and crack to a depth of from twenty to forty feet. Owing to the quarrying and shipping facilities (the Umzimkulu river passing over the beds and giving ample power, at a low cost, all the year round), it is confidently anticipated that the Natal marbles will be able to compete successfully against any other marble consigned oversea; and there is every prospect of securing the Australian market which is now supplied from Vermont. South Africa is not yet a large consumer, but its requirements and demand for this beautiful stone will doubtless rapidly increase when the price is reduced by the introduction of large quantities of the Natal product.

Wool Made from Limestone

A process for making fine wool from the limestone rock found in such inexhaustible quantities in the neighborhood of Alexandria, Ind., is a recent discovery by C. C. Hall, chemist of the steel works at that place, the claim being that, from a combination of 94 per cent. of the limestone, chemicals, and one of the commonest of minerals, pure wool is obtainable as white as snow. It seems that, while making experiments with limestone for his factory, it was found that a certain kind of the material instead of turning to quicklime when subjected to fire, would, when combined with chemicals, turn into lava, and when subjected to another process this lava could be rendered pliable and handled like molten glass. From this beginning the process was pursued and a downy wool resulted, with promise of considerable industrial possibilities; that is, such rock wool is represented to be as soft and white as that produced by sheep, and can be manufactured cheaper than sheep can be raised and clipped, is not affected by fire or water, and the supply seems to be almost unlimited.

The Slate Trade

The Park Slate Company, the new lessees of the Wind Gap Slate Manufacturing Company's quarry, have begun operations. Their specialty is mill stock, for which there is great demand at present.

A company owning patents for the manufacture of cement, bricks, tiles, etc., from ground slate has been looking about Delta, Pa., as a place for the location of their factory. The business would be operated on an extensive scale, grinding from 100 to 200 tons of slate refuse daily.

The Peach Bottom (Pa.) slate quarries are doing a larger business than for several years past.

The annual meeting of the Slatington-Bangor Slate Syndicate resulted in the election of the following directors: Asa L. Foote, James L. Foote and P. N. Snyder, of Slatington; Wm. F. Trexler, of Philadelphia, and Charles B. Brady, of Philipsburg.

Quintus Sandt, Joseph B. Kellow and Samuel Cann are opening the new Diamond quarry on the Blair property, near Pen Argyl. They have put in machinery and expect to begin making slate at once.

A new vein of slate, said to be the finest yet struck in that region, has been opened at Delta, Pa., in the Peach Bottom district. Slabs of slate four feet long have been taken out.

The sale of the Bangor Superior slate quarry was postponed until June 17.

The following officers have been elected by the Wind Gap Slate Manufacturing Company: E. D. Vosbinder, of Johnsonburg, N. J., president; Conrad Miller, of Nazareth, vice-president; P. S. Yetter, of Belvidere, N. J., secretary, and J. J. Heintzelman, of Nazareth, treasurer.

Thomas J. Roberts has been appointed general superintendent over all of the Auld & Conger quarries in South Poultney, comprising the Mammoth quarry, and the celebrated Poultney (Vt.) Slate Company's purple quarry. Both quarries are in excellent condition for making slate, espe-

cially the Mammoth, as they have the largest piece of slate rock ever uncovered in Vermont.

Three men were smothered to death in a cave-in at E. D. Peters & Son's slate quarry at Berlinsville, Pa.

A slate quarry will be opened at Tellico Plains, near Athens, Tenn. The slate so far taken out is of three varieties, green, purple and black. All three are found in great abundance, and can be easily obtained. The purple variety is very rare and is, therefore, especially valuable. The quarries are in close proximity to railroads, so that the products can be readily shipped. Messrs. Herfard & Slawson are the owners of the land on which the slate has been found.

A recent cave-in at Merrill's quarry at Brownville, Me., laid bare a valuable vein of slate over sixteen feet in width. On investigation the same vein was found in the Norcross quarry on the opposite side of the river.

M. F. Atchley is negotiating a deal with a Cincinnati firm for his mill stock slate quarry at Sevierville, Tenn.

According to A. Gesell, in the yearly report of the Hungarian Geological Office, the roofing slates of the Zalatna-Preszak district in Transylvania form a belt about a half mile in width, beginning in the Bibarcz valley, and extending thence to the Fenes valley and beyond. Their coloration is bluish, greenish-gray and red, and they can be split into slabs as thin as 3 mm. Experts have pronounced them very nearly as good as the slates which come from Wales and from France; they can be bored and sawn through, and their behavior in regard to change of temperature is perfectly satisfactory. These roofing-slates are associated with sandstones and marl-slates, all of which are probably of early tertiary age. The roofing-slate industry would be a new one in Hungary, and on the condition of applying competent technical knowledge and sufficient capital, the prospects before it are very good.

Edinburgh Geological Society

At a recent meeting of this society Mr. J. Hay Thorburn read a paper on the fossil shell beds in Sweden. Ninety-five species, he said, had been described, and there might be several more. Dr. Mackie, Elgin, followed with a paper on the chemical analysis of rocks (chiefly from the Moray area). The author described the results of a large series of chemical analyses of granites, diorites, metamorphic rocks, sandstones ranging in time from the Torridon formation to the triassic sandstones of Elgin, river sand, and blown sand, all the materials having been obtained chiefly from the Moray area. A third paper—by Mr. J. W. Kirkby—was on lower carboniferous strata and fossils at Randerstowe, near Crail. These rocks, about 400 feet thick, occurred on the shore, two miles northwest of Fife Ness. The strata—consisting of limestones, sandstones and shales, and some coalseams—he correlates with the beds exposed at Bil-lowness, near Anstruther, though the fossils have a more marine character. A complete list of fossils from some of the limestone beds was given.

Asbestos Mined in the United States

A small quantity of asbestos is mined in the United States. The production for several years past has been between 700 and 800 tons yearly. The only mine now in operation is that of the Sall Mountain Asbestos Company in White County, Georgia. The production is a true asbestos, though of rather short fiber. Discoveries of asbestos have been reported at different times from South Dakota, Montana, Washington, and California, but none of these supposed deposits have ever been developed to any considerable extent. The reasons have been various; in some cases the mineral has proved to be of poor quality and in some the location was unfavorable or the cost of working too great. At present the greater part of the asbestos used in the United States comes from the mines in Quebec. In that province asbestos mines are worked at Danville, Black Lake and Thetford. More recently asbestos has been found near the Ottawa river, but it is not yet worked to any considerable extent there. Asbestos has also been

reported from Newfoundland, but none of the mineral from that country has ever been brought here, and we believe it has not yet been mined to any extent.

A New Fireproof Material

A new fireproof material has recently been invented by a Swiss engineer which is called "papyristite" on account of paper pulp being one of its leading constituents. It will make a solid, impermeable, and jointless roof or floor, and is claimed to be absolutely fireproof. It is also a non-conductor of heat, and while hard as stone, has a soft feeling to the foot and is quite noiseless. Two hundred and twenty pounds of the material will cover an area of $9\frac{1}{2}$ square feet, with a layer .4 inch in thickness. It is mixed wherever it is to be applied, and hardens and dries twenty-four hours after spreading. The substance is transported in bags or barrels like cement, and is always ready for use.

The Dynamite Monopoly in the Transvaal

The dynamite factory at Pretoria represents an original investment of £600,000 in government about five years ago granted ground and buildings. The Transvaal gave this company the sole right to import, make and sell explosives in that state for a term of fifteen years. The monopoly is much opposed by the mining companies on the Rand and elsewhere who claim that if it were canceled No. 1 dynamite, for which they now pay \$17.84 per case of 50 pounds, could be laid down at the mines for \$11.96, including a reasonable import duty.

Graphite in North Carolina

Graphite in small quantities has been found in several parts of North Carolina. Among the principal deposits are those in Gaston, Lincoln, and Catawba counties, which deposits have been worked in a very small way, but recently a deposit of graphite has been found in McDowell county near to the Southern railroad which promises to be of great value.

Limes and Cements

The contempt proceedings against the Mankato (Minn.) Lime & Stone Company has been dismissed. They were accused of violating an order of the court, when they interfered with property alleged to be owned by R. O. Craig. Craig held two mortgages on the property of the company which was turned over to the city for street purposes.

The lime quarries at Bellevue, Mich., will be opened on July 15, or thereabouts. This is said to be the largest stone crushing plant in the world, and is equipped with new and elaborate machinery.

John Fitzgerald, Wm. Don Maus and Charles I. Conklin have incorporated the Mexican Lime Company, of Pekin, Ill., with a capital stock of \$50,000.

Last month STONE announced the incorporation of the Seneca White Lime Company, at Fostoria, O. The company has secured twenty acres of land at the northern limits of the city between the lines of the Hocking Valley & Toledo and Ohio Central Railway companies, where the rock is within two feet of the surface, of the best quality for their purpose and practically unlimited. The plant will be equipped with the most improved machinery, and will have a daily capacity of 1,000 barrels. In addition to the plant the company will also put up a number of modern houses for use of employees.

Follett Brothers, of North Pownal, Vt., will start their lime kiln at its full capacity at once.

Gerhart Becker, representing Milwaukee capitalists, has purchased the Converse Manufacturing Company's plant and water power at Newaygo, Mich., and 2,500 acres of land. A company has been organized with \$1,250,000 capital to manufacture Portland cement from valuable deposits of marl found on this land.

The Sheboygan Lime Kiln Company has lately put into operation a crusher by means of which the limestone from its

quarry is broken into pieces to be used in macadamizing. The small pieces of stone which could not otherwise be utilized are put into the crusher.

The Marble Head Lime Company, of Quincy, Ill., has purchased the quarry at the corner of Front and York streets, from Cyrus Whitney.

The National Plaster Company is constructing a plant near the Hubbell farm, at DeWitt, N. Y. It will make plaster on an extensive scale from gray limestone taken from this farm.

The Olemacher Lime Company, of Sandusky, O., has increased its capital stock from \$200,000 to \$300,000.

J. C. Walraven, general manager of the Wright Lime Works, at Burns, Tenn., was killed by an unexpected dynamite blast.

A Monster Meteorite

A valuable addition to the treasures of the Meteorological Section of the British Museum is on the way from Australia, says "Machinery," of Johannesburg, South Africa. This is known as the "Bruce" meteorite—a monster stranger from the skies, weighing close upon four tons, which fell at Murrangeng, in South Australia. Bruce, who now lives in Scotland, bought it off a farmer, who had no use for meteorites, for £2, for the purpose of presenting it to the British Museum. The Government of Victoria afterwards offered Mr. Bruce £1,000 for his rights, but the offer was refused. The meteorite is composed of almost pure iron, and is said to be the most rare specimen of its sort in the world, though as to weight and composition it does not surpass the forty-ton meteorite said to have been discovered by Sir John Ross in Greenland in 1818. Another celebrated meteorite, the "Cranbourne," found in 1865 in Australia, which has been in England, has been repurchased by the Colony and returned.

Two Cements for Iron Work

A contemporary recommends to take three parts of iron filings, one part of sulphur and one part of sal-ammoniac; work up the whole to the consistency of stiff paste with the least possible quantity of water, and apply it as mortar in the beds or joints to be cemented. Another receipt which will set as hard and as solid as the iron itself, is made as follows: Take fifty pounds of cast-iron borings, coarser or finer as for larger or smaller joints, four pounds of sulphur, a quarter of a pound of sal-ammoniac, cold water enough to cover the whole mass, to be stirred well in. Let this remain a day or two, with occasional stirring before using. When ready, caulk closely into joints. This will be found the best where caulking a joint has to be done; but the first is better where cement is laid in with the work.

A New Insulating Material

Iron felt is the name given a new insulating material made in Germany and being used extensively in Europe for numerous purposes. It is quite successful in preventing vibrations and is used for this purpose between engines and their foundations, also between rails and their sleepers. It consists of the larger and stouter woolen fibres treated first with by-product of petroleum and then coated with gelatine and India rubber and vulcanized. After pressure it is used in the form of plates somewhat over two square feet in area, and from one-half to two inches in thickness. The plates are said to be extremely elastic and imperishable, and have a surface so hard as not to be cut by the sharp edges of bolt-heads or iron girders.

How To Dry Damp Walls

The old plaster is first removed from the walls and the joints. Slabs consisting of rosin 3 parts, tar 2 parts, asphaltum 5 parts and quartz sand 6 parts are then prepared. The smooth surfaces of these slabs are coated with a lacquer consisting of oil of turpentine 2 parts, shellac 1 part, spirit of wine 4 parts, and then strewed with sharp sand, while the rough surface of the plates is fastened to the wall with a mortar consisting of 4 parts sand, 2 parts

hydraulic lime and 1 part Portland cement. The joints are filled in with a putty consisting of 6 parts rosin, 1 part asphaltum and 2 parts powdered lime. They receive then a coat of the above mentioned varnish and are also strewn with sharp sand. The wall is then plastered.

The asphaltum is composed of 15 parts of bitumen, 35 parts coal cinders, 10 parts powdered coke, 130 parts lime and 160 parts fine gravel all by weight. The bitumen and coal cinders are mixed in a boiler, heated and skimmed until the formation of froth has ceased. The powdered coke and lime are then intimately mixed and heated to 575 degrees F. in order to dry them, when they are mixed with the ingredients in the boiler, and finally the gravel is added.

An Old Stone Bridge To Go

One of the oldest bridges in Europe is soon to disappear under the demand for better navigation of the river it spans. This is the stone bridge, with fifteen arches and a total length of 994 feet, built across the Danube at Ratisbon by Duke Henry the Superb in 1135-46. The piers rest on piles protected by stone riprap and heavy ice-breakers; the roadway is very narrow and the footways allow the passage of only one person at a time. Hans Sachs, the poet-shoemaker of Nuremberg, sang its praises as one of the wonders of the builders' art and the strongest bridge in Germany. So far as its stability is concerned, it would probably stand for another 750 years—but it interferes with the passage of steamboats.

Lightning and High Buildings

It is a curious fact that lightning rarely does much damage in large cities. That this is not immediately due to the many metallic structures is proven by the fact that the few bolts which actually strike rarely seek the steel skeleton buildings; they more often strike some modest chimney or tree. It is strange that so very little is known to-day of lightning—unquestionably the first electrical phenomenon ever observed. It is true, though, that knowledge of it is limited almost to a record of observation, no entirely satisfactory explanation of the accumulation of lightning potentials or the action of the discharge itself having yet appeared.—Electrical Review.

Contracts and Building

American Bidders Are Wanted

Minister Finch writes from Montevideo, under date of March 28, 1899, that there appears to be an opening for United States enterprise in the construction of the port at that place. The cost of the work is estimated by Mr. Finch at from \$8,000,000 to \$10,000,000. Representatives of English, German and French firms are endeavoring to obtain the contract, but bids from the United States are desired. Those wishing to bid should write to Mr. Finch in detail.

Government Work

Bids will be received until June 20 for the construction (except heating apparatus, elevator and electric wire conduits) of the United States public building at Helena, Mont. Copies of the plans and specifications may be had at the office of the supervising architect, Washington, or at the office of the custodian of the site, at Helena.

Bids will be received by the Secretary of the Treasury, at Washington, until June 20, for installing an electric light and power plant in the United States customhouse, Cincinnati, O. Plans and specifications can be obtained from the Treasury Department or from the custodian of the building at Cincinnati.

Sealed proposals, in duplicate, will be received at the United States Engineers' Office, Rock Island, Ill., until 11 a. m. June 21, 1899, for furnishing about 109,000 cubic yards rip rap rock and about 262,000 cubic yards brush at localities between Alma, Wis., and mouth of Missouri River. For information apply to C. McD. Townsend, Captain, Engineers.

Proposals will be received at the office of Indian Affairs, Department of the Interior, Washington, until June 28, for remodeling a school building at Salem, Wyo. Plans can be seen at the above office, the office of the Morning Oregonian, of Portland, Ore.; Oregon Statesman, Wyo.,

the Builders' and Traders' Exchange, Omaha, Neb.; the North American Manufacturers' Association, St. Paul, Minn., and at the above agency. For further information apply to H. G. Nickerson, U. S. Indian Agent, Shoshone Agency, Wyo. A. C. Tonner, Acting Commissioner.

Bids will be received at the U. S. Engineers' Office, 735 Capital street, N., Washington, until July 10, for excavating and boring site of new building for the Government Printing Office. John Stephen Sewell, Lieutenant, Engineers.

Bids will be received at the U. S. Engineers' Office, Memphis, Tenn., until July 3, for enlarging and repairing levees in Upper and Lower St. Francis, White River, and Upper Yazoo Levee districts. E. Everett Winslow, Captain, Engineers.

Bids will be received at the U. S. Indian School at Carlisle, Pa., until June 26, for 1,900 square feet of slate blackboard.

Churches

Adrian, Mich.—The First Baptist Society will build a new church.

Albert Lea, Minn.—The Presbyterian Society will build a stone and brick church.

Aurora, Ill.—The Presbyterian Society will build a new church. Rev. Thomas Knox.

Beaver Dam, Wis.—The St. Peter's Catholic Society is taking the first steps toward building a \$25,000 church. Rev. N. M. Zimmer.

Bernardsville, N. J.—The Catholic Society of Our Lady of Perpetual Help will build a \$14,000 church. Rev. Jos. A. Ryan, pastor.

Boston, Mass.—Ground has been broken for the erection of a \$40,000 mortuary chapel, to be erected at Mt. Hope Cemetery. James E. Wood, Ames Bldg., architect.

Chicago, Ill.—John F. Pope, 1647 West Harrison street, has completed plans for a \$100,000 church, to be erected at Jackson

Boulevard and Albany avenue, for the Servite Fathers.

Conception, Mo.—An addition will be built to the monastery here.

Geneva, N. Y.—The Building Committee of the Third Presbyterian Society will soon let contracts for building a new church.

Houghton, Mich.—The plans prepared by Van Ryn & De Gelleke, of Milwaukee, have been accepted for the \$42,000 church to be erected.

Jacksonville, Fla.—A new convent building will be erected on the foundation on the corner of Duval and Market streets. Address Very Rev. W. J. Kenny.

Moline, Ill.—The First Congregational Society has decided to expend \$15,000 in remodeling the church. J. W. Atkinson, trustee.

Newport, Ky.—B. C. DeKamp, of Cincinnati, has prepared plans for a \$15,000 chapel, to be erected for the Greenwood Cemetery.

Pittsburg, Pa.—The Bellefield Presbyterian Society will build a \$35,000 chapel and Sunday school room.

Robinson, Ind.—The M. E. Society proposes to build a \$15,000 church.

Rock Island, Ill.—Eleven thousand dollars have been subscribed for remodeling the First Congregation Church.

Seattle, Wash.—Harry J. Rill, of Detroit, Mich., has prepared plans for building a Catholic church at Seattle. Estimated cost \$25,000. Rev. A. H. Sweere, rector.

Washington, D. C.—Plans have been completed for the Gay Street Baptist Church, to be erected at 31st and N streets, by F. F. Jackson, architect. A prominent feature is to be a lofty tower.

Schools.

Burlington, N. J.—Forty-two thousand dollars have been voted to build a new school.

Cedar Rapids, Ia.—Bids will be received July 5th for building an addition to Adams School and heating and ventilating and sanitary apparatus for the same. J. J. Powell, President of the Board.

Cleveland, O.—Bids will be received for completing the East High School building on Decker and Genesee avenue. Mason work, painting and varnishing. H. Q. Sargent, director.

Converse, Ind.—The adjoining counties will build a \$15,000 school at Converse.

Evansville, Ind.—Bids will be received for erecting a school house. J. J. Stiltz, trustee.

Marinette, Wis.—A. S. Hutchinson will erect a large building to be fitted up as a business college. The school will be opened in September.

Nashville, Tenn.—Thompson, Gibel & Asmus have made plans for the dental college of the University of Tennessee, to be erected on Spruce street, in the rear of the Tulane Hotel. The building is to be three-story, brick and stone. The first floor will be devoted to offices, waiting rooms, and a lecture hall. There will be one large operating room on the second floor and several small work rooms, and on the third floor three large class rooms. Estimated cost, \$25,000.

New Haven, Conn.—Cady, Berg & See, of New York city, have completed plans for the tree-story building to be erected by the Law School.

Syracuse, N. Y.—The Delta Kappa Epsilon Association is preparing to build a large chapter house. Judge Irving Vann, president.

County Buildings, Opera Houses, Hotels, Depots, Etc.

Augusta, Ga.—Plans have been submitted to the council for building the Union depot.

Brady, Tex.—The town will build a new court house. H. P. Jordan, county clerk.

Chicago, Ill.—The Bohemian Turner Society will build a hall on Kedzie avenue, at a cost of \$20,000. Adolph Lonek, 288 W. Twelfth street, architect.

Chippewa Falls, Wis.—The State Board has decided to erect three new buildings at the home for the feeble-minded.

Cohoes, N. Y.—An annex will be built to the Cohoes Hospital. Wm. M. Goddard, architect; George H. McDowell, secretary.

Danville, Va.—The Southern Railway Company will build a new depot at Danville. The building will be brick and stone, 35x100.

Denison, Ia.—The Northwestern road will erect a brick and stone depot at Denison this summer.

Duluth, Minn.—The Duluth & Iron Range road will build freight yards and a large freight depot at Endion as a result of the action of the council in vacating a number of the avenues at the East End, which runs through the road's property to the lake shore. The work will be done some time during the coming summer and fall.

Elmhurst, N. Y.—Cord Meyer has secured plans for an opera house with a seating capacity of 1,500.

Fairfield, O.—Work will soon be commenced on the erection of a passenger station by the C. & M. V. & Hocking railway.

Grand Rapids, Mich.—D. H. Burnham & Co., of Chicago, have prepared plans for a \$75,000 depot, to be erected at Grand Rapids by the Grand Rapids & Indiana Railway Company.

Hornellsville, N. Y.—St. James' Mercy Hospital will be enlarged. Joseph Cameron, secretary.

Iowa City, Ia.—The plans of Rush, Bowman & Rush, for a new court house, have been accepted. A new jail will also be erected.

Kaufman, Tex.—The Texas Midland is preparing to build a new depot.

LaCrosse, Wis.—John A. Moller has prepared plans for the proposed Masonic Temple.

Lamberton, Minn.—A plan is on foot for the erection of an opera house by a stock company. Mayor A. H. Mohler is having plans prepared.

Lebanon, Ind.—The commissioners of Boone county have accepted and adopted the plans and specifications for a new court house and a contract for the building will be let July 29th. Estimated cost, \$200,000.

Minneapolis, Minn.—Capt. C. C. Bennett, battery D., of Minneapolis, and Adjutant General George C. Lambert, of St. Paul, are working on plans for building a new armory.

New Haven, Conn.—The Y. M. C. A. has selected the plans prepared by Brown & Von Bern for the association building to be erected.

North East, Pa.—The Lake Shore road will build a \$35,000 depot at North East.

Quincy, Ill.—The Menke Stone and Lime Company have begun work on a morgue at the Soldiers' Home. An addition to the hospital will also be built.

St. Louis, Mo.—High Service Engine House, No. 1, will be reconstructed. The specifications call for 6,080 cubic feet concrete, 5,200 cubic feet brick masonry, 3,350 square feet hollow tiling, 500 square feet marble, 186,000 pounds iron and steel work. Robert E. McMath, president.

Spokane, Wash.—Cutter & Malingren have prepared plans for a \$25,000 hotel to be erected by L. G. Heiberg. Work has commenced on the foundation.

Warren, Minn.—The county commissioners have accepted plans and specifications for a new court house. Bids will be advertised for. The chairman of the board was appointed a committee to confer with the board of charities and corrections and get the approval of the proposed plans of the new jail.

Business Buildings.

Chicago, Ill.—A cold storage warehouse will be built on Michigan street, between Cass and Rush streets. Frederick Espert, owner. Cost, \$75,000.

Chicago, Ill.—Botsford & McReynolds will build an elevator at 106th street and Calumet river. Cost, \$260,000.

Fairfield, Me.—The Somerset & Kennebec Company, owners of the pulp mills of Benton Falls, and other extensive properties, are to build a paper mill at an expenditure of about \$200,000 at this place.

Lexington, Ky.—Mrs. Byron McClelland has had plans drawn for a \$100,000 office building, to be erected at the corner of Short and Upper streets.

Madison, Wis.—The Schlitz Brewing Company, of Milwaukee, will erect a building in the Sixth ward to cost \$30,000.

Martin's Creek, Pa.—William Kruse & Sons' Concrete Company are preparing to erect an immense plant here. D. K. Boyd and F. H. Lewis, architects and engineers, are preparing plans.

Pittsburg, Pa.—The Central Safe Deposit Company propose to build an \$800,000 office building on Smithfield street and Second avenue.

Union City, Ind.—The Union City Cold Storage Company will erect a \$200,000 warehouse. Jarvis Hunt, 1407 Monadnock Building, Chicago, architect.

Youngstown, O.—Thomas Powell will erect a two-story store building at No. 257 East Federal street.

Bridges.

Alton, Minn.—A stone bridge will be erected south of the Alma City river bridge in district 3 of the town of Alton. James Joice, town clerk.

Elkader, Ia.—Read township will build a stone arch bridge. Jefferson and Millville townships will build a steel bridge with two and three stone abutments respectively.

Springfield, Mass.—City Engineer Slocum has prepared plans for abolishing grade crossings on the New England railroad. The plans call for overhead crossings on the part of the railroad, and considerable mason work is involved.

Greek and Gothic Masonry.

As masons, the Greeks carried the art of building to the highest excellence. The Grecian architect possessed the means which his mind required. His elements were few. Scarcely any variety of structure was required from his art. He placed a larger number of columns around the more sumptuous edifice; and a smaller number around the more humble structure; he raised the temple and the tomb. His career was definite; he saw the end of it. He was required to perfect rather than to invent. Grecian architecture submits itself to the judgment, and the judgment is satisfied. A problem has been proposed to which a perfect solution has been given. The Grecian architect performed all that he had proposed to himself; all that he wished to have was given to him; and so soon did the Grecian style attain its wonderful perfection that from the earliest to the latest period a few elegant improvements, scarcely to be discerned even by the practiced eye—a few tasteful variations, rather to be described by the learned than felt by the spectator—are the only tokens which denote the progress of Grecian art from infancy to maturity. Such were not the labors of the Gothic Freemason; he stops frustrated, but not in disappointment. Neither the quarries of Pentelicus nor the chisel of Phidias could assist him. Rude materials and still ruder hands were all that he could command. His architecture must depend on its innate character and significance. The cathedral is to be considered rather as a forethought than as a finished specimen. It exhibits

the effort that has been made to embody those abstract ideas of solemnity and grandeur which could not be fully realized or accomplished by human power. Still the effect has not failed. Gothic architecture appeals to the imagination, and fancy half supplies the deficiencies of the material scene. A Gothic building has always the charms of mystery, it always appears to be larger than its actual dimensions. The mouldings, the pillars, the arches, always create receding shadows; and to the mind the idea of space arises from a succession of shadows, just as the conception of time results from the succession of ideas.—Illustrated Carpenter and Builder.

Reconstructed Granite.

The "Street Railway Journal" describes a new fireproof material. It is made of granite chips, pulverized, moulded into form and fused together at a temperature of 3,000 degrees Fahrenheit. It can be heated red hot and thrown into cold water without being injured. It resists the action of acids and alkalies and is frost-proof, having been tested by liquefied air at a temperature of 350 degrees below zero, without injury. Its crushing strength is very high. Two moulded forms are shown: One is the sectional insulator block used between the sections of the third-rail system at Manhattan Beach; the other is used on the Brooklyn Elevated railway. At Niagara Falls a test showed that it required 56,600 volts to penetrate about one-half inch of this material.

New Coating for Iron and Steel.

A new process for coating iron and steel consists in the use of a bath consisting of zinc, tin and aluminum. It is claimed that this produces a coating which is much superior to any now known, adhering so firmly that the sheet will stand working after it has been applied and will resist corrosion and can even be heated red hot without injuring it. The coating is applied in the same manner as in the well-known process of galvanizing, that is, by dipping galvanized sheets in the metal alloy. The most approved mixture is made by melting together 84 parts of zinc, 14 parts of tin and 1 1-2 parts of lead and 0.5 of a part of aluminum. The process is patented.



Trade Notes



The Sullivan Machinery Company, of Chicago, has issued a handsome new "Diamond Drill Catalogue No. 29." This goes very thoroughly into the subject of core drilling, not only giving a practical description of the different sizes of machines manufactured, together with weights, capacities and prices, but also showing how a plant should be set up and operated. Complete instructions for the setting of diamonds in bits are given, and these are accompanied with cuts showing the bit in the different stages of setting. A great many valuable testimonial letters have been printed, and also a list of the customers, showing mineral prospected for, the size of machine used, and the address of the customer. This list shows that the Sullivan drills have been shipped to all parts of the world, and are now being used in Mexico, Central and South America, Canada, Alaska, Siberia, Japan, Australia, Sumatra, Africa, Spain, France, Germany, Norway, etc. The catalogue shows machines designed to be operated by hand, steam, air or electric power. Besides being manufacturers of mining machinery, the Sullivan Machinery Company are contractors for prospecting, and a list is given of parties for whom work has been done, showing the number of feet drilled and the mineral sought. Although Catalogue No 29 is devoted principally to the core drill, twenty pages in the back of the book have been given to a general description of the Sullivan rock drills, channeling machines and coal mining machinery. The catalogue is undoubtedly the most complete as yet published on the subject of the core drill and its work, and will be gladly sent to any one interested in prospecting, from any of the Sullivan Machinery Company's offices.

Advertising has become such an important adjunct to successful business concerns that more attention is now being paid to the character of the "copy." The Trade Paper Advertising Agency, 150 Nassau

street, New York City, is sending out a little booklet entitled "Advertising Designs," which shows some handsome specimens of good advertising. It is free to all advertisers using trade journals.

The Illinois Steel Company, Rookery, Chicago, has issued a handsome illustrated booklet devoted to their steel cement. The company says of its product that "steel Portland cement is a masonry and foundation material. It is ground to the greatest possible degree of fineness, and consequently the tensile and compressive strength of the material when mixed with sand, or as used in practice, not only fulfills the most rigid specifications for work of the highest class, but very materially exceeds them. It is not primarily a sidewalk cement, neither will it give the best results in exposed work in very dry atmosphere; but in heavy concrete work of all kinds, where high strength is requisite, no better material can be obtained." The tests and pictures given in the booklet relate principally to work done in and around New Orleans, largely in connection with the new drainage system of that city. At the present time the plant of the Illinois Steel Company produces about 1,000 barrels of cement a day, and owing to the increased demand, there is in course of construction at South Chicago a new plant of far greater capacity, which, when completed, will make the Illinois Steel Company one of the largest producers of cement in the world.

The Garvin Machine Company of New York has an advertisement, on another page, of second-hand planers for sale. This is one of the largest companies manufacturing machinery, and its products are esteemed all over the world. This business was established in 1862, was incorporated in 1889, and has always been the manufacturer of machine tools and machinery. The plant is located in one of the most substantial and modern buildings of the city and the striking success the

company has met with is the best tribute of the quality of its goods.

Messrs. Frenier & Le Blanc, of Rutland, Vt., report that business is very good indeed with them at the present time. They have fitted up their sand feed on twenty-two gangs for Volkening & Co.'s new mill in New York; on twenty gangs for the Brandon Italian Marble Company, of Middlebury, Vt.; on three gangs for the South Dover Marble Finishing Company, of Canton, Ga.; on four gangs for the Carthage Marble and White Lime Company, of St. Louis, Mo.; two gangs for the Nelson Manufacturing Company, also St. Louis, Mo., and two gangs for Greenlee & Sons, Denver, Col. They are also shipping a few to England and Scotland. Most of these are nearing completion. All those who are feeding their gangs in the old way should investigate the Frenier & LeBlanc system, which is adopted by all of the best firms. It is guaranteed to save labor and to do more and better sawing than the old methods.

The Lincoln Iron Works, of Rutland, Vt., has just started a number of the Gilmour Double Platen Planers. This is the very latest tool in the line and possesses unique features adapting it to the widest possible range of work. The essential feature of this machine consists in placing the beds of two narrow machines side by side and spanning the entire width with one heavy cross-rail, carried on posts of special construction. These beds are properly tied together by heavy cross-ribs; each bed is complete and carries all the moving parts of a complete machine. The platens are so constructed that they can be locked together and run as one, or by removing two locking keys they become entirely independent of each other. They are driven by screws and bevel gears, the same as in the standard machines, but one screw is made with a right-hand and one with a left-hand thread, and the shipping mechanisms are built to correspond. Thus it will be seen that when the platens are running independently on stones of the same thickness they are just as efficient as two single machines. The company has just placed one special machine of this class which planes 100 inches wide by 16 feet 0 inches long and 48 inches high in the works of the Webb Granite & Construction Co., in Worcester, Mass.; one that planes 100

inches wide by 12 feet 6 inches long and 48 inches high in the works of John Hutchinson & Son, New York; another of the same size in the works of W. L. Morton, Astoria, L. I.; one that planes 72 inches wide by 14 feet 0 inches long and 48 inches high in the works of Eirich & Ruppenstein, at Evergreen, Brooklyn. The company is about shipping another of the same size to John Hutchinson & Son, New York.

The Perry-Matthews-Buskirk Stone Co., of Bedford, Ind., is now furnishing stone for the addition to the Metropolitan Museum of Art in Central Park. This is of the celebrated buff stone, which is susceptible of very fine carving. The stone runs of a uniform quality and can be furnished in large quantities, very desirable features in such a building as this, which will take 500 carloads. This is one of the reasons why the stone has such a prestige and was selected for this building at a price considerable over other quotations. The Manhattan Life Insurance building, of No. 66 Broadway, is another excellent example of the stone from these quarries.

The Diamond crushed steel and steel emery are maintaining their hold on the stone industry, as they always have done. Since the first of April the orders of the Pittsburg Crushed Steel Company have been coming in more liberally than for some years past, demonstrating not only the appreciation of this material but the better condition in the stone trade. The trade in general, east, west, south and north thoroughly accepts the merits of this material and many concerns are increasing their purchases largely.

On another page will be found an advertisement of Preslar's New Prospecting Core Drills. This takes special cores from 1 inch to 10 inches in diameter of all rocks passed through, thus furnishing a cheap, fast and accurate method for prospecting stone quarries and mineral lands. The Bloomington (Ind.) Drill Company makes a specialty of prospecting by contract with this system.

The Clayton Air Compressor Works have issued an illustrated catalogue giving full descriptions of gas compressors and compressed air tools. The greatly extended use of compressed air in quarries and stone cutting gives this a particular value to every reader of STONE.

Mr. Alfred C. Torbert and Frederick A. Peckham have formed a partnership under the firm name of Torbert & Peckham, for the purpose of carrying on a business at No. 1603 Monadnock Block, Chicago, Ill., as general purchasing, manufacturers and selling agents for general contractors and railroad plants of every description, mining and general machinery, supplies, etc., both new and second-hand. Mr. Torbert has had many years of experience in the engineering and contracting field and is thoroughly familiar with the contracting business, from making the estimates to planning for the machinery to execute the work and complete and settle up the job. He has been for the past eight years the general purchasing agent for McArthur Bros. Company, of Chicago, who rank as one of the largest firms in this line in the United States. He is, therefore, peculiarly well fitted for acting in the capacity indicated above. Mr. Peckham has had considerable experience in this line, and has for the past eleven years been connected with the regular staff of the "Engineering News" of New York, being for three years in the editorial department and for several years the manager of their Western branch, with headquarters at Chicago. This firm is already acting as general purchasing agents for several very large corporations and is therefore able to save contractors and purchasers of machinery money on their plant, at the same time enabling them to have their interest looked to promptly and intelligently without losing time themselves to visit large business centers. They solicit correspondence with all parties interested.

A recent and notable victory for Minnesota material, that will help give the stones of this State the recognition they deserve, was the adoption of the Kettle River sandstone for the entire facing of the new Des Moines public library, says "The Improvement Bulletin." This is being erected on an entire block facing the Des Moines river, and between the two most prominent thoroughfares leading to the capitol. This is an ideal location, and was only selected after much controversy. It is to be an all-stone building of pure classic style, and was designed by Smith & Gutterson, of Des Moines, who have handled it in a very able manner. The entire building will cost from \$150,000 to

\$200,000. The competition gradually narrowed itself to Ohio Buff Amhurst and Minnesota Kettle River and the facing stone was finally awarded to the Minnesota Sandstone Company, of Minneapolis, for \$41,954. Des Moines is to be congratulated on the public spirit which has made possible such a fine home for the public library.

Mineral Resources of Texada Island.

Alfred Raper has written an article for "Mines and Minerals" on the new and promising British Columbia mining field, from which we extract the following.

Texada Island is situated in the Gulf of Georgia, in about 50° north latitude, about 130 miles from Victoria, 50 miles from Nanaimo, about 75 miles from Vancouver, and 18 miles from the coke ovens of Union. The island has a population of about 400, a postoffice, and money order office; three wharves, and the Government of British Columbia has, during the past year, completed a trunk road across the island from the west coast to the east coast. The island is about 33 miles in length, bearing southeast and northwest, and about five to seven miles wide. The waters of the Gulf are generally of great depth along the rocky shores of the island which is on the direct route to the great gold fields of Northern British Columbia and Alaska.

The general formations of the island are granites, porphyrites, and limestones. The granites are chiefly found on the east coast and from the finer textures of many of the outcrops may be classed as syenitic, though we occasionally find the biotite granites intruding through the limestones. The east coast, next to the main land at its southern extremity, consists chiefly of porphyries along the coast line, but a short distance back from the shore is an extensive body of limestone near to the foothills of Mount Shepard, our highest mountain, which is about 3,000 feet high. One portion of this limestone deposit is epidotic in character; each red blotch in the rock has a white center giving it a "bird's-eye" maple appearance. Between this epidote marble and the blue-gray limestones, a narrow belt of schist occurs. Northerly, along the coast an outcrop of biotite granite appears, while the interior hills are porphyries and limes, amongst which de-

posits of magnetic iron ore occur. Going northerly towards Marshall Point is one continuous body of limestone, with a few minor intrusions of porphyries and it is in this particular part of the island that most progress has been made in mining.

Passing along the northern end of the island the Texeda lime works are seen, where the celebrated "snow-flake lime" is made from the dark blue granite limestone which is so extensively distributed over this part of the island.

Passing westerly from the lime works at a short distance the limes give place to the dioritic porphyries varying from a fine-grained porphyrite to what is classed here by our miners as a "snow-flake porphyry." This is found usually a short distance back from the beach, assuming a remarkable block cleavage, with peculiar "stars of feldspar" over its surface. It is an orthoclase feldspathic rock, or felsite porphyry. It is in this rock that some of our richest specimens of free gold have been found; also some good deposits of copper and gold are being worked, with a very encouraging outlook. Over this lie the heavy deposits of lime before mentioned. About one and a half miles from the beach are found beds of the blue gray limestone lying between the porphyries. Those limestone strata generally dip into the porphyries at a slight angle here and it is amongst those heavy lime deposits that the richest copper deposits, so far opened, are located.

Deposits of slate are said to exist in the center of the island. A remarkable thing is that no claim has yet been abandoned upon which a reasonable attempt has been made to prospect.

The major portion of the island is yet a "terra incognita" to prospectors. In the valleys of the center of the island some deposits of clam shells are found embedded in fine sands and gravels in a remarkable state of preservation. The writer collected sixteen varieties of the limes varying in color from white to black, one specimen of which, when polished, resembles hailstones. The greater portion of the limes are susceptible of very high polish. The Sturt Bay Company has during the past few weeks had a force of men building wharves and preparing the ground for excavating the marbles for sale, while the fine pieces and culls will be burnt in the new kilns into lime and sent to Vancouver

and adjacent cities. In several places in conjunction with the limes a ferro-oxide occurs, assuming a spongy shape the base of which is silica.

Galena and Nickel Mining in Quebec.

In the Geological Report of Canada, recently published, Dr. R. W. Ells says:

"The most important mining developments along the lower Ottawa, at present, are on Calumet Island. Here the old workings on the Lawn property, near the east end of the island, on blende and galena deposits, have been extended, and development work is now carried on over three lots on range IV. The containing rocks are largely dioritic, with some reddish granite, and these masses are intrusive through the gray gneiss and limestones. These latter are well exposed along the Roche Fendu channel of the Ottawa on the south side of this island. The principal workings at present are on what is known as the Bowie property, where a large open cut has been made on an ore-body in the diorite, that carries both blende and galena. The ore-body is of considerable extent, but is pockety in its character, and no well-defined hanging or foot walls were seen, though the mass sends off spurs into the enclosing diorite. Over 1,000 tons of ore was mined at this place during the past summer, and the ore finds a ready sale in the European market. On the west part of the area a shaft has been sunk to a depth of nearly 130 feet, in order to cross-cut and intersect several masses of ore that appear at the surface in this vicinity, but work on this location was suspended during the season in order to fill orders from the Bowie pit. There is evidently a large quantity of mixed blende and galena ores in the intrusive rocks of this district, but in none of the openings examined was any well-defined vein structure noted, the ore everywhere appearing rather in pockety masses, though some of these are of large extent.

"About three miles to the northwest of this mining area, on lots 11 and 12, range IX., another interesting deposit of mineral has recently been opened on the property of Mr. E. P. Cowan. The ore here is different from that on the eastern end of the island, being mostly a pyrrhotite, which carries both nickel and cobalt. The as-

sociated rocks are diorites that cut a series of gray and rusty gneisses and crystalline limestones. A large knoll of the diorite rises to the south of the ore-bed, which has a thickness of about twelve feet, and between it and the diorite mass is a band of crystalline limestone. The ore itself is associated with another band of diorite that apparently traverses gray gneiss, the latter being seen beneath or to the north of the ore deposit. On the river a short distance to the south of this mine, the formation is mostly a crystalline limestone, and the intrusions of diorite and granite in this rock can be easily seen. The bed of pyrrhotite at the Cowan mine dips to the south at an angle of about 50°. A shaft has been sunk to a depth of about 40 feet and cross-cuts have been made to test the thickness of the deposit.

"Between this place and the Lawn property, there are several points at which mineral indications have been noted, but little attempt has as yet been made to ascertain their value."

Canada's Market for Minerals.

In the Summary Report of the Geological and Natural History Survey of Canada, just issued, Dr. Dawson says:

"Some trouble has been taken to obtain representative specimens of Canadian feldspars from deposits capable of yielding this mineral in large quantity, and some of these have been experimentally fused in the kilns of the Ottawa Carbon and Porcelain Company and forwarded in that condition, together with the crude material. Feldspar is extensively employed in the manufacture of pottery and porcelain, and if it can be laid down at the works in England, at a satisfactory price, although the percentage of profit to be anticipated is small, there is no reason why the industry may not assume very large proportions, the Canadian material being apparently quite equal to that produced in Scandinavia. Considerable shipments have already occurred to potteries in the United States.

"Molybdenite is another mineral for which a considerable and growing demand appears to have been established, particularly in connection with the employment of molybdenum in alloys of iron and steel. Mr. Willmott was instructed in July to visit and report upon some of the best

known and most accessible occurrences of this mineral, and specimens of the more important of these deposits were sent to the Imperial Institute. As a result of this, prices were quoted for the mineral, in England, that appear to afford a good margin of profit for the working of some at least of these deposits.

"In connection with the above and other mineral substances which Canada is capable of producing and supplying to new markets, I may add that the greatest difficulty has been found in inducing the owners of deposits of the kind, not previously worked, to make even trial shipments of their products. Many proprietors are ready to sell undeveloped properties at good prices, but are either unable or unwilling to put the matter on a commercial basis. The inquiries received are not, as a rule, directed to the acquirement of deposits, but to the practical question—at what price and in what quantity can a given mineral be delivered at a stated market. The acquisition and locking up of mineral deposits for purposes of speculation only, has, in fact, become a serious deterrent to the development of Canadian mining, to which the attention of the proper authorities in the several provinces might, it is believed, be usefully directed.

"Among the minerals for which special inquiries have been received during the year, the following may be mentioned. Some of these have not yet been found in Canada, or not in quantities that appear to be of commercial importance, but most of them may be looked for in different parts of the Dominion, with prospects of success, while others are already well known.

"Asbestos, Antimony ores, Bismuthenite, Corundum, Chromic Iron, Feldspars, Fire Clays in British Columbia and the Northwest Territories, Fluorspar, Graphite, Gypsum, Iron-pyrites, Iron Ores (Bessemer and titaniferous), Limestone (pure, for manufacture of calcium carbide and dolomitic or magnesian limestone for use in connection with wood-pulp manufacture), Molybdenite, Mispickel in Ontario, Mica, Marble for ornamental purposes, Magnesite, Natural Gas in Quebec, Nickel, Osmium, Platinum, Pottery-clay in the Northwest, Peat, Phosphate or Apatite, "Quartz" for paviers of grinding pans, Sand for glass-making and for "sand-

(Continued on page 68.)

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"Nearly all the substances above noted were required for purchase or immediate utilization in connection with different industries, and a large proportion of the inquiries came from Great Britain, the United States and the continent of Europe. Whenever possible, the inquirers have been either placed in correspondence with persons working or owning the minerals asked for, or have been informed of the localities and under what conditions these minerals are known to occur."

Royalty in a Welsh Slate Quarry.

"The Quarry and Building Merchant" has the following article: The Duke and Duchess of York, with Lord and Lady Carrington, on April 27th, drove from Gwydyr Castle through Bettws-y-coed to Llanberis, a distance of twenty miles, for the purpose of visiting the Llanberis quarries, the second largest in Wales. The royal pair arrived at Llanberis about 2 o'clock, in glorious weather. A splendid view was obtained of Snowdon, whose rugged peaks were capped with snow. After coming through the pass a superb view of the Llanberis lakes and the lovely valley was obtained—in the distance the shiny streak of the Menai Straits. All the heights near Llanberis were dotted with spectators. The children of the village school—350 of them—had obtained permission from Mr. Vivian to view the scene, and as the duke and duchess passed by they sang "God Save the Queen." Luncheon was provided in a spacious marquee on the lawn of the house where Mr. Brinckman, one of the managers of the quarry, resides. The royal party, escorted by the Hon. Mr. Vivian, then entered a small train specially provided, consisting of a miniature engine and five open trucks, painted yellow with black borders, and carpeted with crimson cloth. The engine had been prettily decorated with heather and broom and also with flags. As the royal party ascended the improvised platform and took their seats the crowd cheered lustily. A thousand workmen, clad in black cloth coats and white corduroy trousers; just leaving work, lined the side of the railway, looking for all the world like a regiment of sol-

diers drawn in line. Up, up, the party went from one incline to another around the vast amphitheatre. Another small engine took them along the circuitous route of the California gallery, with high precipices of rock rising on the one side and a steep abyss below; and here at a height of about 1,500 feet above the sea level a grand view was obtained of the quarries. There is one gallery where horses generally draw the truck, but on this occasion they were pushed by the gentlemen of the royal party, assisted by the officials. In this fashion the trucks progressed for fully half a mile, when a halt was called. Her royal highness, in a very simple way, at this point produced an astounding result. She pressed an electric button, and immediately an alarm was sounded all through the galleries. A few minutes afterwards scores of shots were fired, and thousands of tons of slate, rock, and debris tumbled down the mountain side from every gallery in the quarry.

The Energy of Explosives.

Louis V. Schermerhorn read a paper on this subject before the Engineers' Club at Philadelphia. Mr. Schermerhorn said:

All comparisons of the relative energy of explosives must be accepted as rough approximations since, the same explosive under apparently similar conditions gives discordant results. This probably arises from the fact that the same explosive compound varies somewhat in its exact constitution according to the purity of the materials used in its formation; and, again, exact measures of the forces developed by explosives are impossible. It has been calculated that one pound of nitroglycerin develops about 1,100 foot tons of potential energy. Compared with one pound of coal, which has a potential energy of about 5,000 foot tons, there is a marked contrast. On this point it has been suggested that the explosive has to expend a large amount of work in converting its condensed oxygen into gas before it can combine with the combustible elements of the explosive.

The rationale of the detonation of explosions is not well understood. That it is not solely due to heat is evidenced by the fact that it is possible to detonate wet guncotton; and from the phenomena of

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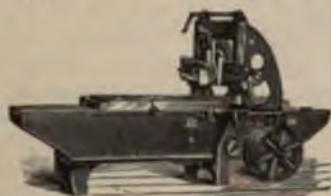
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STONE.

sympathetic explosions, which will be referred to later, it would seem that detonation may possibly arise from the vibratory action of the detonating agent upon the molecules of the explosive. The elements of the explosive molecule are retained in stability by delicately balanced forces; and if these forces are thrown into changed vibrations by an external force, such as the sharp initial explosion of a fulminate, the molecules of the explosive are broken up and detonation follows. It is known from experience and observation that the energy of a high explosive depends somewhat upon the character of the initial detonation by which the main explosion is secured. One ounce of gunpowder, even when strongly confined, exploded in contact with guncotton, only inflames it, while ten grains of confined fulminate of mercury produces a full explosion of the guncotton. Forty-five grains of fulminate exploded unconfined, only inflames guncotton. Quite large quantities of dynamite detonated in contact with guncotton only disperse it, while a small amount of dry guncotton detonated upon a mass of wet guncotton produces a perfect explosion.

That the energy of explosion depends upon the nature and force of the initial explosion is probably true of all explosives, including gunpowder. A too low initial explosive will simply produce a rapid burning, instead of a detonation of the explosive. Through a defective exploder I have seen one charge of dynamite, out of a large number simultaneously exploded under water, simply burn, with the continued violent boiling of the water over the charge for several minutes. It is evident from experience that an initial detonation of at least a definite intensity is required to obtain from the explosive its maximum effect. With an insufficient initial explosion combustion ensues, while with a sufficiently large initial explosion complete detonation results. As guncotton is exceedingly inflammable, this material, with the exception of small quantities, is generally kept wet. The wet guncotton can be efficiently exploded by the initial explosion of a small quantity of dry guncotton, in which the fulminating cap is exploded. As a protection against the premature explosion of nitro-glycerin, it is frequently kept, until required for use, in a congealed or partly

frozen condition, which occurs at 45° F. The detonation of high explosives is generally obtained through the aid of electricity, by which a fulminating cap or fuse, containing about 24 grains of mercuric fulminate, is initially fired in the explosive. By this means a certainty of fire is secured, and, when, as in blasting, a number of holes are to be fired at the same time, an increased efficiency is secured by the simultaneous discharge of all the blasts at the same instant. In the removal of Flood Rock, East river, in 1885, 150 tons of explosives were fired by this method at the same instant.

The Diamond Drill.

Carbons in diamond drills are usually reset after 40 feet of quartz, or 150 feet slate. These and their settings constitute the greatest item of expense. Six to eight 3-carat stones are used to each bit, and they cost about \$15 per carat; as it costs \$10 to set a bit, this would make each 6-carbon bit cost \$280. The cost of wear and tear per foot varies from 30 to 50 cents, according to the hardness of the rock. An average drill, including, say, 600-foot rods and 2 bits, would cost about \$2,000.

Origin of Petroleum.

There are three working hypotheses. First that petroleum is of animal origin; second that it is of vegetable origin, and third, that it is of mineral origin. Recent investigations of Engler and Gacunski, on the petroleums and asphalts from the vicinity of the Red sea, support the animal origin theory. It has been pointed out by opponents that if petroleum were of animal origin we should find nitrogen compounds in it, and these are mostly lacking. But these two scientists have found in the Red sea petroleum, as well as in the asphalt, nitrogen compounds. Thus the oil from Gemesh contains 0.3 per cent., and that from Gebel 0.7 per cent. of nitrogen, and the investigators think that the nitrogen is present in the form of pyridin and piperidin bases. Asphalt from the vicinity of the Red sea has been found to contain as much as 2.1 per cent. of nitrogen. In petroleum from the Caspian sea Charitchoff has found 0.14 per cent. of nitrogen.

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A New Canal for Germany

A scheme is before the Prussian Diet for effecting a communication between the Rivers Rhine, Weser and Elbe. The canal, which is to be made suitable for vessels up to 750 tons burthen, will start from Ruhrtort on the Rhine, joining the Weser at Minden and the Elbe at a short distance from Magdeburg. The cost is estimated at 261,000,000 marks, and the total length of the canal will be 290 miles.

The Carrara Marble Combination

The London "Quarry and Builders' Merchant" says: After many weary months of preparation the company which claims to have brought together most of the principal Carrara marble quarries is about to make its splash. The quarries, it is claimed, have been worked 2,000 years, the number of men employed is 5,000, irrespective of the 1,600 sculptors hanging around, and yet we are told that the quantity of marble removed is a mere insignificant fraction of the marble in sight, and to be worked in the future. In truth, the Marble Quarries of Carrara, Limited, is a romantic, picturesque company, and we are loth to enter into a mere mundane criticism of its finances. Meantime, suffice it to say that the capital will be £590,000, divided into 295,000 6 per cent. cumulative preference shares and 295,000 ordinary shares; that the purchase price will be £462,500, of which at least £300,000 will be in cash; that there will be no valuation or past profit statement; that the chairman will be Mr. E. Boulnois, M. P.; and that the promoter is Mr. James Kirby, of "Financial Post" fame.

The Temperature of Soil

At a recent meeting of the Royal Meteorological Society, held at Westminster, London, Mr. H. Mellish read a paper on "Soil Temperature," in which he discussed the observations from the thermometers at various depths in the soil, which had been made at the stations of the society. It appears that in nearly all cases the annual temperature of the soil at a depth of one foot is slightly higher than that of the air. In winter the air and the soil at one foot have about the same temperature, the soil being often a little warmer till about the

end of January, after which, for the next two months, the air has a small advantage; but in the summer months the soil at one foot is generally warmer than the air.

Stone in Judea

The hill near Jerusalem, where the crucifixion of Our Lord occurred is formed of limestone. The shores of the Dead Sea are lined with pumice stone, showered out of some volcano that destroyed Sodom and Gomorrah, which cities finally sank beneath the waters of the Dead Sea.

Where Sir Christopher Wren Lived

The dwelling of Sir Christopher Wren is now a national school in Botolph Lane, London. The house still contains a finely carved wooden staircase, but his private chapel has become a warehouse, with a window over the ceiling. Nearby stands the church said to have been designed by his daughter, and which is peculiar in that the stone of which it is built remains white to some extent in spite of all the city smoke.

Composition of the Ash of Coal

The researches of Schulze, Jensch and others made several years ago are still quoted as affording an insight into this matter. Schulze found in the flue-dust from a battery of boilers in Saxony that the following substances were present, viz.: zinc, lead, thallium, cadmium, iron, calcium, lithium, sodium, potassium, all as sulphates. In addition to these, magnesia is also found, together with manganese and phosphorus. Jensch has calculated that per ton of certain coals there would be a metallic iron, 38.10 pounds; manganese, 2.79; zinc, 1.23; lead, 0.14; cadmium, 0.009; phosphoric acid, 2.90; sulphur, 13.37.

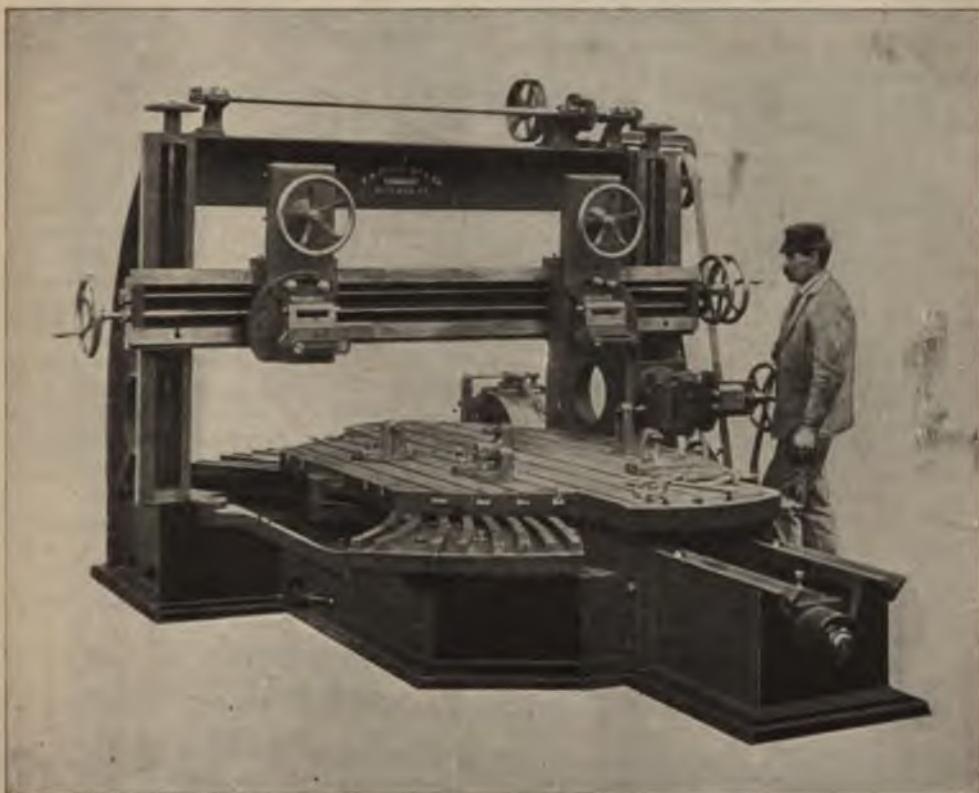
He took the output of coal in Upper Silesia for one year, and calculated the loss from the ashes of the coal as follows, in metric tons: Iron, 220,000; manganese, 16,170; zinc, \$7,130; lead, 865; cadmium, 66; sulphur, 77,400; phosphoric acid, 16,820.

Stone Sawing in the Rhone Valley

In the stone quarries of St. Triphon, in the Rhone Valley, the stone is sawn by means of continuously running steel wire cables, kept moist with wet sand.

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Internal Corrosion of Wire Ropes

Thomas G. Lees, M.E., read a paper on this subject before a recent meeting of the Federated Institution of Mining Engineers. Mr. Lees said:

Corrosion as applied to wire ropes means a gradual eating away of the substance of the wire, the metal being converted into oxide of iron, etc. It is entirely distinct from abrasion and cannot be mistaken for it.

Shaft waters differ greatly in composition, some being very harmless and others very corrosive, but the best of them in connection with air may cause corrosion.

There are various stages of corrosion, beginning with a very slight pitting which is scarcely perceptible, but if disregarded the wire soon becomes very much reduced in strength. If the bright surface of the wire is pitted it has been found that a great part of its strength has been lost. This peculiar action has in the past not been fully recognized and failure has often been attributed to the inferiority of the wire. It is usually due to the action of moisture in the form of steam or water alone, or with the addition of furnace gases. There are three points in a winding rope where it has been found from experience that corrosion usually takes place, first, at the cap-end of the rope; second, where the ropes rest on the pulley when the cages are at the top and bottom respectively; and third, on the underlapping rope at the drum. At the second and third of these points, the strands of the ropes are opened more or less, due to the bending over the pulleys and under the drum, thus allowing water to enter more easily at these points than at other parts of the rope, but it is at the cap-end that the wires suffer most, and this is probably due to the fact that every time the cages settle on the props or keeps at the pit-top and at the pit-bottom, a certain amount for the wires to untwist and bend, and thus the strands open somewhat and allow the water to percolate into the inside of the rope.

If all the failures of winding-ropes could be ascertained, it would be found that by far the greater number occur within a few feet of the cap from a variety of causes, and not necessarily from corrosion alone. Owing to many of the accidents causing no loss of life or personal injury, official records are not obtainable. In my opinion,

the only practical way of dealing with part of the rope is periodically to cut off a few feet and recap the rope. It is hardly necessary to give the advantages of a systematic recapping, but the two most important are:

1. By cutting off a few feet of the rope the inside strands can be thoroughly examined and tested and if found in good order the cap may be put on again.
2. Letting out the rope from the drum to replace the length cut off changes the position of the pulleys where the greater strain has to be taken when lifting from the bottom. It is advisable under ordinary circumstances to cut off about 12 feet from each rope.

The operation is simply this: One rope, after being recapped, is lowered by the engineman and attached to the cage, and this causes the other rope to be 24 feet too short, so that it has to be let out from the rope provided and kept coiled around the inside of the drum. Thus each rope is altered 12 and 24 feet alternately at each recapping. Sufficient spare rope is allowed for in ordering a new rope to provide for recapping, in addition to the two rounds of rope which must be left on the drum.

In sinking shafts, it may be an advantage to cut off a greater length than in ordinary cases of winding ropes, as the ropes are subject to more bending and twisting near the cap-end, and to varying strains in addition to the corrosive action of the water.

This corrosion takes place even when flaws occur and deceive the inspector. The lubricant on the outside may cover up ropes and it is impossible by the usual systems of outward inspection to discover the internal condition of the rope. The old hempen core ropes were particularly subject to corrosion, but the efforts to overcome it in the wire core ropes have not been entirely successful. One of the best preventives to corrosion is the galvanizing of the wires. As a result of a number of tests I have found that the failure in strength in galvanized wire is so small as to be practically of no importance.

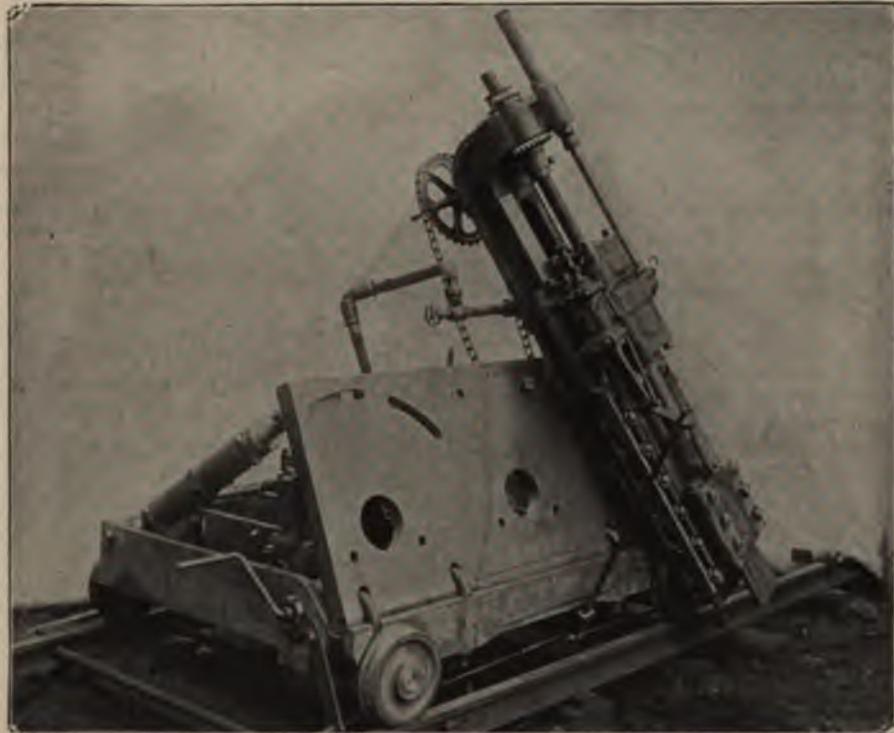
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Mica Mining in Canada

Mr. J. Obalski, Inspector of Mines, Quebec, has just issued a report dealing with the mica mining industry of Canada. Mr. Obalski says:

"There has been considerable development in the mica industry, in proof of which it suffices to remark that in 1897, from 50 to 100 men only were employed in it, while in 1898, the number of persons employed in the mines and in trimming the mica exceeded 250, with seven or eight important mines in operation and some twenty prospects producing a little mica. In the course of the year, a large number of prospecting licenses in the counties of Ottawa and Pontiac were taken out. In the latter, some discoveries were made, so far of little value but which may lead to more important finds."

The demand for amber mica, which is almost exclusively shipped to the United States, is good and we must believe that the Canadian mica is well appreciated, seeing that it finds a regular market notwithstanding the high duty of 20 per cent. ad valorem and 6 cents per pound, on thumb-trimmed mica and 12 cents on the knife-trimmed article, and it may even be remarked that the consumers, while being very hard to please as regards the fashion in which the mica is prepared, are less so with respect to the quality itself; certain dark colored micas, which were formerly difficult of sale, now finding purchasers much more easily. The demand also appears to be better for small mica and less for the large, which results in the first place from the great difference in the price, which may range from 5 cents for one by three inches to \$1 per pound for mica of large dimensions. These large dimensions were formerly necessary, but they are now replaced by plates of micanite (prepared by E. Munsell & Co., of New York), or of micabeston (prepared by W. H. Sills, of Chicago), which are nothing but thin sheets of small mica glued one upon the other and afterwards pressed to the thickness of one-sixteenth of an inch, thus forming plates which are cut any desired size. The United States customs duties are paid by the consumers and weigh more heavily on the small than on the large mica. Thus, mica of 5 cents per pound or \$100 per ton has to pay 20 per cent.

or \$20, besides 6 cents multiplied by 2,000 or \$120 thus $\$20 + \$120 = \$140$ or 140 per cent., while mica of \$1 per pound, or \$2,000 per ton has to pay 20 per cent. of \$2,000 plus 6 cents multiplied by 2,000, namely $\$400 + \$120 = \$520$ or 26 per cent., freights being the same. The tariff of 12 cents on knife-trimmed mica also explains why thumb-trimmed mica especially is shipped upon which there is only a duty of 6 cents, besides the 20 per cent. ad valorem. The mica is sold in barrels weighing 350 pounds net."

Our illustrations show some of the principal producing mines in Quebec and three unique "snaps" of the work being done by Mr. Smith, of Kamloops, on his Tete Juan Cache property, Canoe River district British Columbia.

The Blackburn mine was for many years worked at a profit for phosphate, but on the collapse of this industry the owners directed their attention to the production of mica, and at present about fifty persons are regularly employed at the mine.

Wren's Style

There is no work of Wren's which betrays an exaggerated or a false taste, says the London "Illustrated Carpenter and Builder." There is a harmony of parts, a justness of proportion, a judgment in the general design and a propriety in the decoration that disarm criticism, and that please even the uneducated. This arises no doubt chiefly from that quality we call genius, and which the ancients call men's divinior, that which animates the poet as well as the painter and architect; but in Wren's case this was strengthened and corrected by a profound mathematical as well as practical knowledge of construction, and a minute acquaintance with detail. His great principles may be summed up in three words—utility, propriety, beauty; principles which have been the guide of every true architect in every age and in every style. In Gothic architecture he was less successful. The spirit was extinct, and all its traditions departed, and forgotten both among architects and workmen. His detail, therefore, as might be expected, offends us now; but if we look at the general arrangement of the masses of St. Michael's tower and St. Dunstan's-in-the-East, the general idea of the gate-

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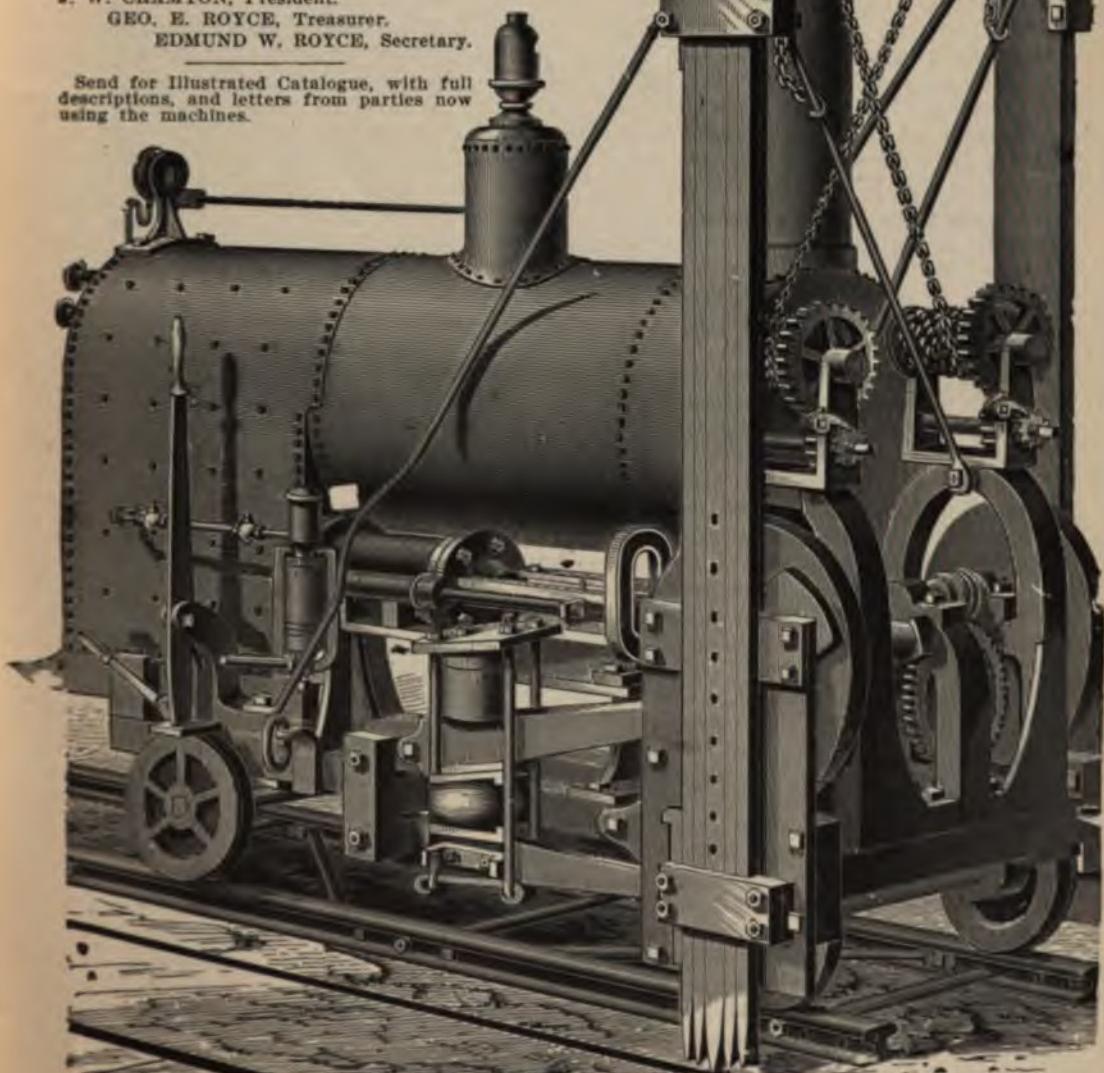
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way at Christchurch, and, in fact, many other attempts in the Mediæval manner, even prejudice must concede that, had he lived in the present day, when styles are so well classified and defined, and when workmen abound who can execute groining, tracery, and carving, when all appliances and means are ready to the hand he probably would have excelled as much in Gothic as in Classic art.

New Rhine Bridges

Two remarkable arch bridges over the Rhine were completed last November and December. The one at Bonn has one great arch of 187.9 m. (617 feet) span, between two river piers; the other, at Dusseldorf, has two shore piers, one central river pier, and two arches of 181 m. span. They are at present the largest iron arches in Europe. The iron structures of both bridges were built by the Gute Hoffnungshutte, of Oberhausen, not far from Dusseldorf. The two bridges have many features in common; the more striking one is, perhaps, the Bonn bridge with its fine arch. The roadway is suspended from the arch in such a manner that only the first two panels with their rods reach below the roadway. The arch, therefore, seems to rise, as it does, from the piers, and the roadway forms the chord which cuts the arch only close to the piers. The effect is decidedly pleasing. The top and bottom girders are vertically above one another. In sinking the piers the water was first dammed off by sheet piling. Inside this piling of wood, I irons, alternately of large and small section, were then driven into the bottom so as to form an iron wall inside the wooden piling. The inner space was now excavated. The piles had afterwards to be removed. This was done in a novel way. The irons were drilled at the required level, an iron cable was then fastened to the respective iron and to a tug, and the I, weakened by the holes, bent over one way. A crane then bent it back. In most cases this operation sufficed to break the iron; occasionally the process had to be repeated. In erecting the girders, the first two panels mentioned were first put in position, held together by temporary bolts and screws. The roadway was then rested on the false work, and the girders were completed. This

done, the roadway props were lowered so that the structure rested in itself. The girders were now riveted and their false work removed. The architecture is at Bonn held in mediæval castle style; the capitals are somewhat realistically modern. The Dusseldorf bridge has seven piers, including the abutments, and a total length of 2,000 feet. It was built in seventeen months, and cost about £200,000. Prof. Krohn was the designer of the iron structures of both bridges. Both are intended for light railways or tramways only, not as proper railway bridges. They are described very ably in the "Zeitschrift des Vereins Deutscher Ingenieure."

The New Explosive—Kallenite

An exhibition of the power of the new explosive, "kallenite," was given recently at Sydney. A party, on the invitation of the Kallenite Syndicate, proceeded by the steamship Mermaid to the Glebe Island quarry, where stone is being removed by the government for the purpose of making an approach to a new bridge between Balmain and Pyrmont. It was sought to see what could be done with kallenite as a matter of comparison with the other explosives used. The experiment was carried out under the direction of Mr. T. E. Burrows, of the harbors and rivers department, who is in charge of the works. Four holes had been drilled to a depth of 16 feet, and each had been charged with twelve pounds of kallenite. The charge was fired by electricity, and dislodged with comparatively little upheaval some 200 cubic yards of stone. There was little noise and hardly any perceptible smoke or fumes. Kallenite differs from dynamite in that, instead of being largely composed of an incombustible baselike infusorial earth, eucalyptus leaves and ti-tree bark are used. The whole compound, in short, is explosive, and this, it is claimed, adds to its efficiency and economy at the same time. The absence of smoke is said to render kallenite a desirable explosive for military purposes. When the government tests are complete it is intended, provided they prove as satisfactory as expected, to form a company and to establish in Sydney a manufactory for its production and export. The inventors are Mr. J. Callaghan and Mr. A. Fraser.

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Oliver Cromwell's School

A movement has recently been started in Huntington, England, looking to the extension of the grammar school in which Oliver Cromwell was educated. The school as it now stands is the only remaining part of the institution entitled "The Hospital of St. John the Baptist," founded by the first Earl of Huntington in the twelfth century. It has undergone many changes, but still some of the original examples of Norman work remain. There is no other building in existence, says the London Chronicle, which has been so intimately associated with Oliver Cromwell. It was here that he was educated until he entered Sidney Sussex College, Cambridge.

The Hospital of St. John the Baptist must have been an important institution in mediæval times. It was once a house of refuge for pilgrims, a hospital for the sick, a charity for the poor, and a school for the young. The gable of the remaining part of the building stands opposite All Saints' Church, where the register of Cromwell's birth is kept. In Cromwell's time royal pageants must have passed and repassed this school when Cromwell's kinsman at Hinchinbrook was feasting royalty so sumptuously that he entertained himself into insolvency and had to sell the property. King Charles, as a boy, is supposed to have met Cromwell at his uncle's house, and the two no doubt visited this school.

How much of the original building was in existence in Cromwell's time is not known. For some unexplained reason the building was encased in brick outside and inside. This could not have been done with the intention of strengthening the walls, which were already over three feet in thickness. The outside casing was removed in 1863, and the building was restored in 1878. The whole building, except, perhaps, some of the columns and arches, was removed, the stones being numbered and replaced as nearly as possible in their original positions. A new roof was erected, and new stonework was used for the upper part of the building in harmony with the original. Still, the building retains its Norman expression throughout, and the restoration served to reveal some of its solid and dignified features, which were formerly concealed.

Part of the edifice certainly dates from the twelfth century. The chief facade is distinguished by a fine Norman doorway recessed in three orders. Above it is an arcade with two window piercings, and in the gable of this end appears the symbolic device of the vesica Piscis. The whole front is terminated by the addition of a bell gable.

There is an arch bricked up in the other gable, and the side walls consist of two great bays bricked up, except for modern windows they contain. Each of these bays and arches is in a different style. The arches opposite are not pure Norman work. A slot in the stone work of the arch which faces the school playground would suggest that the building which now remains had been partitioned off from the original.

The interior of the building is 24 feet long by 24 feet wide. It is a very plain schoolroom, where two teachers try to carry on their work simultaneously, but with great difficulty. The room contains prints of Cromwell as Lord Protector and as a child. The building is utterly inadequate for the purposes of a grammar school, and it is quite unworthy of the town. It is strange that an attempt has not been made before now to preserve this building for its historical interest and erect a new and modern school.

Malmaison

All the external work of the restoration of the Chateau of Malmaison is now finished, and it is expected that by the time the summer arrives the place will be ready for the visits of Napoleonic enthusiasts and tourists. The chateau, it will be remembered, has been purchased by M. Osiris and restored at his expense so as to serve as a museum of imperial souvenirs. Everything possible has been done to make Malmaison and its park resemble its former self, when it was the residence of the Empress Josephine. The internal decoration is still unfinished, and it is hoped that the State will soon send to the chateau or museum some of the Napoleonic furniture which is scattered through the national museums and the ministries. A bed used by Napoleon is, for instance, at the Grand Trianon, and M. Osiris is engaged in negotiations with the director of the fine-arts



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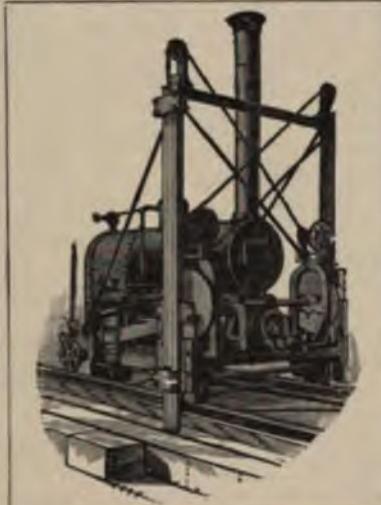
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department for the return of this and other relics of the sort to Malmaison, whence they were formerly removed. Private owners of Malmaison souvenirs are in the meantime ready to restore them to the place so as to help in the work of making the chateau a thoroughly interesting Napoleonic museum. Interest in the imperial haunt is in the meantime bound to be revived by the latest book of that indefatigable writer on Napoleon, M. Frederic Masson, entitled "Josephine de Beauharnais." According to his custom M. Masson has hunted up and utilized every possible document about the fascinating creole adventuress who became by a contract passed in the fourth year of the First Republic Citoyenne Bonaparte, and subsequently Empress of the French. Napoleon is represented by the author as a serious young man of the marrying class, who easily fell a victim to the seductions of a transatlantic siren and faded coquette, by whom he was duped while he was gaining victories in Italy. M. Masson, in fact, shows us Napoleon as a blind and doting lover, deceived by a designing woman, while Taine, on the other hand, has presented the Emperor as a monumental personage too much absorbed by greatness to be capable of descending to the level of ordinary beings who are easily fascinated by coquettishness and good looks.—Paris Correspondence, London Telegraph, February 6.

Mining in China

The operation of the coal, silver, lead, and gold mines in the province of Shantung is not without interesting features. In a report made to Consul John Fowler, Chefoo, by Mr. Earle D. Sims, of Tai-an-Fu, it is stated that the coal mine at Chwan Kou Tswang, which has a seam four feet thick and a shaft down on it to the depth of 240 feet, has been allowed to fill with water because the government could not decide which one of the two claimants really owned it. There was an accident in a silver-gold mine at Lin Tu Tswang by which several men were killed. In order to prevent the recurrence of such impediments to mining the government had the mine closed. In Chon Che Chwan Tzi there was a silver mine and it was

worked profitably until the government fancied that certain lawsuits might arise in connection with it, and this was closed.

At Yea To Tswang there was a good coal mine but when foreigners offered to buy it the people suspected them of evil intention and refused to sell at any price. At Hsi Ku Chung Tswang there was a coal mine with a seam over five feet thick and an 80-foot shaft.

Ten years ago there was a famine in the neighborhood and the mine was closed. It has not been reopened. At Ch'ia Tsi Te there was a copper mine, but when the people in the vicinity began to quarrel over the ore the government closed it. Thirty miles from Tai-an-Fu there is a mountain called Tan, where gold was found. The government feared disturbances and forbade people to work it. At Pang Gar Low people began to fight over gold found in the vicinity and the government had the place closed. At Whang Chwan Tswang there was an iron mine, but trouble arose over the operation of it and the government closed it down.

In other parts of the Empire there are numerous and most annoying obstacles placed in the way of those who propose to operate mining concessions. In the Ningpo district recently a mob destroyed the mining plant of a foreign corporation and the manager was lucky to have escaped with his life. A well known engineer from Pittsburg, who was in China for nearly eighteen months, reports occurrences in connection with the carrying on of work that reveal a state of affairs almost incredible. He is a man who does not speak of things he knows nothing about, and what he has said is to be taken as drawn from personal experience, or based on good authority. Altogether, mining in the Flowery Kingdom is attended by well nigh insurmountable obstacles.

Early Frescos Discovered under Whitewash

At Nideggen, in the Rhine province, thirteenth century frescos have been discovered under the whitewash in the parish church. The whole interior decoration of the church, including the polychrome treatment of pillars and capitals, has been preserved remarkably well.

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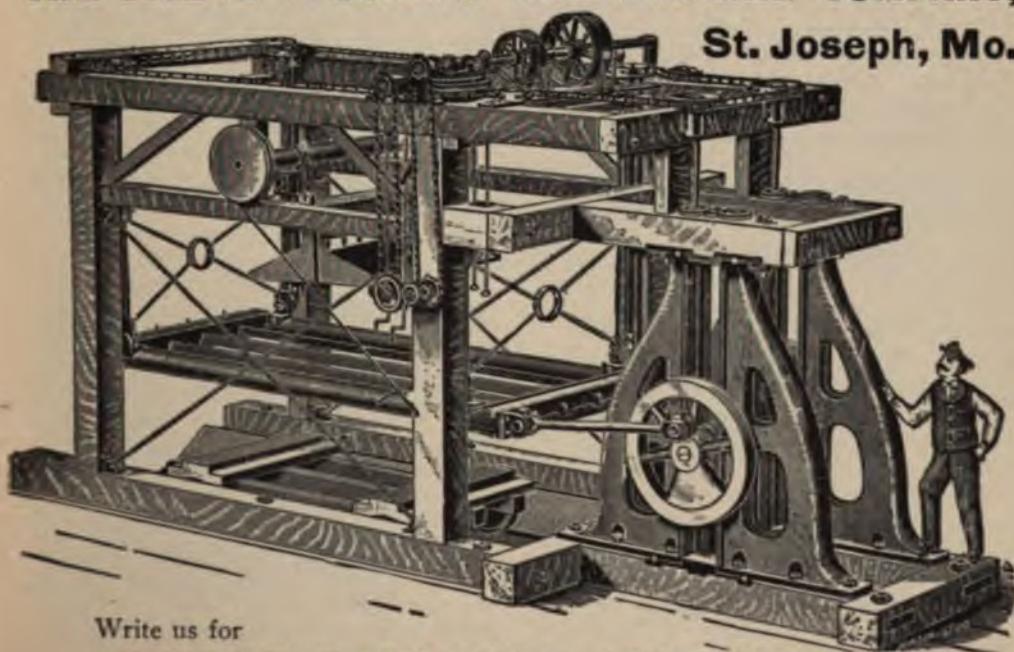
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A Decision on Building Contracts

A decision of interest to builders was made recently by Justice Ketcham in Kalamazoo, Mich. A builder by the name of Nichols brought a suit against one Crowley for a note of \$52.94, the balance in payment for the building of a house which was erected for Crowley in the spring of 1896. The defendant made a cross claim of damages amounting in all to \$73, which he held was due as a result of bad workmanship and work done not according to contract. In support of Mr. Crowley's claims three expert witnesses, all considered authorities on the work of building, testified that the house was in need of repairs that would cost \$73, and that the work was incomplete. Nichols' defense to Crowley's claim laid in the attempt to prove that there never was any contract, which, however, the latter maintained did exist. When the trial was finished it had been established that the house had been built much to the contrary of Crowley's wishes and in an unworkmanlike manner, and a decision was rendered by the court in behalf of the defendant Crowley and against plaintiff Nichols in the sum of \$23.30. The court held that when a contractor engages to build a house for a party, that, even though there is only a verbal contract and no specifications are made as to work or material, a workmanlike manner of doing the work is implied. It is held that because Crowley signed the note and expressed himself as satisfied with the house soon after its construction, this will not serve as a bar to prove the demerits of the work at a later time, as he, not being skilled in workmanship, might not have been aware of the faults when he gave his sanction.

An English Decision Adverse to "Picketing"

A case was decided in the English Chancery Court a week or two ago that will have an interest for American labor organizations:

In the Chancery Division of the High Court Mr. Justice Stirling gave judgment in a case, Charnock and others vs. Court, in which the plaintiffs, master joiners at Halifax, sued the officials of the Halifax branch of the Amalgamated Society of Carpenters and Joiners, and sought an injunction to restrain the defendants, till

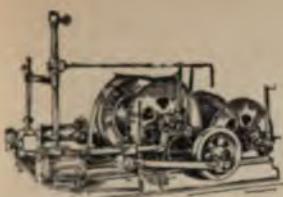
trial of the action, from watching and besetting the landing stage at Fleetwood, the railway station at Halifax, or the works of any of the plaintiffs, for the purpose of persuading or preventing persons from working for the plaintiffs, and also to restrain the defendants from procuring persons who had entered into contracts with the plaintiffs to commit a breach of such contracts. The action arose out of a strike of operative carpenters which is going on at Halifax, and for the plaintiffs it was alleged that the defendants had met, at Fleetwood and at Halifax, men brought over by the masters—some of them under a twelve months' agreement—from Belfast to work for them, and had induced them to break their engagement. His lordship, after reviewing all the evidence in the case, granted an injunction restraining the defendants from watching or besetting the landing stage at Fleetwood, or any other place where persons about to be employed by the plaintiffs might be brought, for the purpose of inducing such persons not to work for the plaintiffs.

Dredging for Gold

The gradual erosion of gold-bearing banks of the streams and rivers naturally causes a deposition of strata lower down, containing more or less gold. These alluvial bottoms, sedimentary bars and beds of streams have, until recently, been considered as beyond the reach of any ordinary method of working.

They were not capable of being washed or sluiced, because they were already at the lowest level. Various attempts to dig the material up and elevate it into sluices, from which it could be worked, were made; but the constant presence of water in such workings and the great cost, or impossibility of drainage, rendered such efforts abortive. Miners were compelled to be content with scratching the surface or sinking shallow pits until overcome by the water, and speculating upon the unknown and untold riches that lay just beneath their feet.

The bottom of the alluvial deposit, or "bed rock," as it is termed, is generally where the richest pay is found, due to the natural gravitation of the gold. Thus it comes about that attention has been turned to dredging as a method of reaching these



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deep and submerged deposits effectively. On the face of it a simple enough problem, yet what vast sums have been spent in the mistaken efforts of those who did not fully appreciate all the conditions involved, and how elusive the little yellow grains are when attacked under water! The seductiveness of the gold attracts many to engage in a mad and determined search for it, and it is not strange that, like moths around a candle, some should come to grief.

The truth is that gold mining is a business which must be learned, like any other business, and it is just as amenable to the natural laws which govern it as any other of the practical sciences. What would be said of a tailor who engages in watch making, or of a merchant who endeavors to design a bridge or a locomotive? Yet we see the merchant, the manufacturer and the business man launch out into gold mining and make simple calculations of the enormous wealth that can be taken out of their claims at so much per cubic yard, and assume all the responsibility of the practical and technical work.—A. W. Robinson in *Cassier's Magazine* for May.

Canada's Imports of Mining Machinery

Notwithstanding the very large and rapidly expanding business done annually by our Canadian manufacturers of mining machinery, an industry which has assumed substantial proportions with the growth of mining throughout the Dominion, it is worthy of remark that our imports from other countries show a corresponding increase, says the "Canadian Mining Review." During the year ended 30th June last we find that machinery to the value of \$207,737 was admitted duty free as against a value of \$128,780 imported in 1897. The United States supplied \$177,046, Great Britain \$22,063, and Germany \$3,306. Ontario took \$96,159, British Columbia \$47,530, Quebec \$30,038, Nova Scotia \$15,371, New Brunswick \$10,946, N. W. Territories \$2,372, and Manitoba \$30. In addition to the above there was imported dutiable mining machinery to the value of \$38,589, of which \$31,664 went to Ontario and \$6,682 to British Columbia. These figures, however, convey but an approximate idea of

the importance of our mining industry to the trade of the country, for we find in the "Trade and Navigation Returns" many entries of machinery and supplies consumed by our mining industry which are not classified in the tariff items relating to mining. Here are a few culled at random from the report: Pumping engines and machinery \$93,594, crucibles \$12,533, Diamond drills \$5,291, chrome steel (shoes and dies, etc.) \$16,044, copper plates \$231,-938, quicksilver \$36,425, cyanide \$4,481, wire rope \$58,524, wire cloth \$10,672, explosives \$12,127.

The fact that the bulk of this trade has so far been secured by the United States should stimulate the British manufacturer to greater zeal and enterprise in making a bid for a larger share of our mining business.

Spain's Sulphur Mines

In this paper, which was read before the British Institution of Mining Engineers, at its recent meeting (February, 1899) Mr. Arthur Wilson says that the sulphur mines of the Sierra Gador are situated about eleven miles north of the port of Almeria. Railroad communication has now been established between Almeria and Gador by the new line between Almeria and Linares. The formation in which the native sulphur occurs may be classed as Middle Eocene, composed of coarse-grained limestone, limestone conglomerate and clay marls. The sulphur has permeated all these strata. In the limestone it occurs in the joints and cavities, associated with gypsum in large masses; in the conglomerate it occurs as a cement, binding the rounded pebbles together and in the marls the sulphur is present as innumerable veins. Between the marls and conglomerates in many places there is found a band varying in thickness of almost pure sulphur assaying probably 90 per cent., the ordinary yellow sulphur alternating with narrow parallel ribbons of black sulphur.

The sulphur occurs generally in an opaque form, although occasionally crystals of translucent and almost transparent sulphur are found. So far as proved, the sulphur-bearing zone at Gador measures about 1,300 feet in length by about 400 feet in width and 160 feet in depth. The

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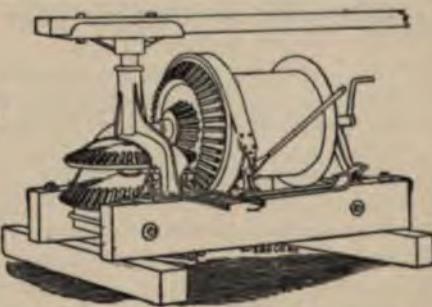
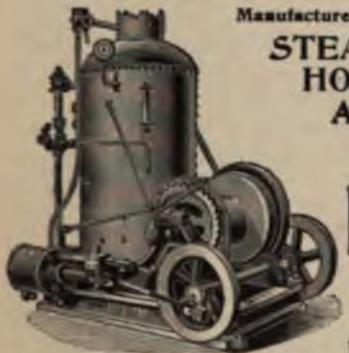
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average sulphur contents may be reckoned at 15 per cent.

The deposit has been attacked by a number of shafts and levels, but no uniform method or system of working has been followed. The winding is carried on in a curious way. An endless wire rope is made to pass over pulleys at the surface, and thence to the drum of the engine, whence it passes to a pulley at the bottom of the shaft. There is no cage of any kind, but the baskets in which the ore is gathered are hung on the traveling rope by means of a short cord with which each basket is furnished; the end is given a half hitch round the wire rope, and it never seems to slip. The baskets are hung on, every ten or twelve feet apart, and the rope travels at a slow speed. A man at the surface unslings them as they arrive, and the empty baskets are sent down in the same fashion.

A Fossil Whale's Head, Embedded in Sandstone

A fossil whale's head, the remains of oysters and other things of the sea have just been unearthed in Monterey county, at a place 2,500 feet above the sea level and eighteen miles inland from the present coast line, says the San Francisco "Call."

The whale's head was found on the Finch ranch, near Jamesburg, and not far from Tassajara Springs. It is the almost perfect specimen of a portion of a whale's head from where it joins the vertebral column to about midway the length of the jaw, with the eye-socket and part of the ball plainly discernible. The petrification is of the right side of the head, measures 30 inches in length, 18 inches in width, and 12 inches in thickness, and weighs 350 pounds. It was discovered two weeks ago by a resident of the Jamesburg region, John Clenford, and was so tightly embedded in the sandstone formation of the ridge of the mountain that its contour was disfigured slightly in removing it.

Cement from Blast Furnace Slag

According to a process patented in England by Mr. C. Von Forell, Gassein, powdered slag is mixed with limestone in pieces and heated in a furnace arranged for continuous working, and in which three zones of temperature are maintained. In

the first (nearest the mouth of the furnace), the temperature is below 100° C., and the combined water, etc., driven off in the second zone is condensed and absorbs the carbon dioxide given off. This carbon dioxide desulphurizes the slag. The mixture passes to the second zone and is dehydrated, after which it enters the third zone, which is hot enough to decompose the limestone and afford the carbon dioxide necessary for the desulphurization. The frit is then removed, powdered, and the final burning of the cement completed in a separate operation.

Durability of Stone

To ascertain the comparative durability of marble or other calcareous stones, immerse equalized cubes of various stones in dilute muriatic acid of the same degree of strength in different vessels. Those which dissolve most slowly will be least liable to decay. Palladio says soft stones, and stones the nature of which we are not acquainted with, should be quarried in the summer, and exposed for two years to the effects of air and frost before being used.

When this can not be done, stones that are not calcareous may be tested in some degree by immersing them in water, by exposing them to red heat and to frost, or by covering them with dilute nitric acid for several days. The stones which absorb the least quantity of water and which are least changed by the action of acid, heat or frost, may be fairly considered as most capable of resisting the effects of the atmosphere.—Stonemason.

Corrosive Effect of Gases on a Steel Building

The Central Meat Markets, London, it is stated, have been weakened by the corrosive action of the steam and destructive gases arising from the thousands of trains that pass and repass beneath the markets during the week. But, according to the City Press, there is no reason to believe the rumor that the markets are likely at any moment to disappear into the tunnels beneath. In places where the metal-work supporting the fabric above has become weakened by the action of the gases and steam, series of brick tunnels and archways are being erected.

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Terre Haute, Ind., June 12, 1899.

The building trades are all very busy at this time, and quite a number of three and four-story store buildings are under way. Some of these have been held back for want of iron, etc., but this has been supplied, and work is now in full progress. There is also a great deal of small building work going on in the way of frame houses, so that carpenters are in great demand all over town. Mr. D. P. Erwin, of Indianapolis, who returned from Europe only a few days ago, has accepted the plans of Floyd & Stone for a block of new buildings on the former Havens & Geddes Company corner. The contract for building has been let to August Fromme, the price being between \$35,000 and \$36,000. The front on Main and the entire frontage on Fifth street will be of Green county (Ky.) white limestone. It will be beautifully carved. Mr. Fromme has sublet the stone work of the buildings to the Terre Haute Stone Works Company, Mr. Edward Chadwick, Superintendent.

TERRE HAUTE.

Evansville, Ind., June 10, 1899.

The stone trade is in fair condition. A number of men have been employed since October last on the new water works building, which is now nearly completed at a cost of \$15,000. The trustees of the Southern Insane Hospital have let the contract for the \$40,000 addition of brick, with stone trimming, to Korner & Bailey, of this place. The stone work will not exceed \$1,000. A chapel in Oakhill Cemetery, all of stone, estimated cost \$10,000, Paris & Shobell, architects, has been let to George F. Weikel. Mr. Weikel has also the contract for the new water works, a \$60,000 job.

SHOENBAUM.

Coal in Russia.

The production of coal in Russia is 1898 is estimated at 10,250,000 metric tons, against 9,750,000 tons in 1897. The increase

of 500,000 tons came from the Donetz Basin and from Western Siberia; the mines of Poland were nearly stationary in their output. In all Southern Russia and along the Volga the use of coal is declining, owing to the large consumption of astatki or petroleum residuum from the Baku refineries. This is used in locomotives, steamboats and factories, and is the cheapest fuel in a large part of the region named. It is especially cheap in the towns on the Volga and its tributaries, to which it can be carried by water from Baku.

The Necropolis of Hallstatt

In a secluded valley in upper Austria, close to the border line of Salzburg, by the little Alpine hamlet of Hallstatt, a remarkable necropolis was discovered more than a half century ago, which marked an epoch in archaeological research. Excavations at this place alone, far from any present considerable seat of population, have already revealed more than three thousand graves. The primitive culture here unearthed, represented by all kinds of weapons, implements, and ornaments, bore no resemblance to any of the then known classical ones of the Mediterranean basin. Its graves contained no Roman coins or relics. There was nothing Greek about it. It contained no trace either of writing or chronology. It was obviously prehistoric; there was no suggestion of a likeness to the early civilizations in Scandinavia. It was even more primitive than the Etruscan, and entirely different from it, especially in its lack of the beautiful pottery known to these predecessors of the Romans. Little wonder that von Sacken, who first adequately described it in 1868, and Hochstetter, who worthily carried on his researches, believed that Hallstatt represented an entirely indigenous and extinct Alpine civilization. On the other hand, so exceedingly rich and varied were the finds in this out-of-the-way corner of Europe, that another and quite different view seemed justifiable. Might this not be an entirely exotic culture? products gained by trade from all parts of the world, being here deposited with their dead by a people who controlled the great and very ancient salt mines hereabouts?—From the Origin of European Culture, by Prof. William Z. Ripley, in Appleton's Popular Science Monthly for May.

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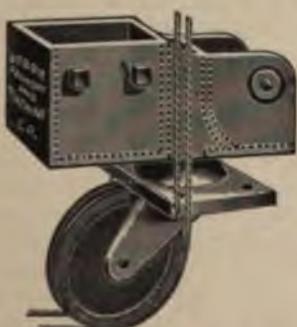
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Book Reviews.

THE COFFER-DAM PROCESS FOR PIERS. By Charles Evan Fowler, Member Society of Civil Engineers. New York City, John Wiley & Sons.

The name of Mr. Fowler is familiar to readers of Stone, to which he has been a valued contributor. He is a bridge engineer of experience and ability, and the present work is destined to take a high place among the technical publications of its class. In his introduction Mr. Fowler says, "that the greater part of foundation work is of an ordinary character. And while difficult foundations have been quite fully treated by engineering writers, ordinary ones have too often been passed over with mere mention, or treated in such a general way, that the information proves of little value in actual practice." The history of the coffer-dam process, he says, would seem to indicate that engineers of nearly a century ago gave more consideration to the smaller problems than the engineer of to-day, who has apparently passed to the consideration of the larger and, of course, more interesting ones. That this is deplorable, is proven by the many cases where money has been wasted in the after effort to make good the mistakes that have become apparent where cheap construction of coffer-dams has been resorted to. The saving in ordinary cost, as between an indefensible method and a defensible one, is often so small as to seem absurd when it has become necessary to make large expenditures to rectify the errors. Difficulties that can not possibly be foreseen will occasionally confront the most careful engineer, and the value of this book is that it cites many expedients to be used, and gives hints as to the best methods to be employed from the start. Mr. Fowler has written ten chapters, covering the ground very completely. He writes first of the historical development of the coffer-dam, from its use in Roman and other ancient foundations up to the great works of the present day. Then he takes up construction and practice, dealing with cribs and canvas, pile driving and sheet piles, metal construction, pumping and dredging, finally giving an excellent chapter on foundations, and the location and design of piers. The synopsis of examples gives no less

than forty-four coffer-dams, that have been built at different places and under widely different conditions. Each of these he has taken up in the body of the work. In the appendix will be found a number of approved specifications. The book is profusely illustrated and should find a place in the office of every practical engineer.

THE GENERATION OF POWER. New York, The Hazleton Boiler Company.

This is one of the handsomest of recent catalogues. It is a richly-bound and profusely illustrated book, describing the celebrated Hazleton boilers, the work they accomplish and their method of construction. It is full of useful tables of statistics, such as: The Specific Heat of Water; Weight of and Heat Units in Water From 32 Degrees to 212 Degrees; Properties of Saturated Steam; Factors of Evaporation, etc.

Iron Screws in Stone Walls

For securing engines and other machinery, also for wall brackets for shafting and for other purposes, it is often desirable to screw bolts into stone walls, and it is difficult to secure a firm hold. The following method is used with success, says the American Machinist. Of the originator of it we are not informed: A wire of suitable thickness is coiled on the screws so as to follow the threads of the same, and to form a kind of screw nut. The coiling may commence near the head of the bolts and proceed toward the point by laying the wire into the grooves. After arriving at the point of the screw the wire may be wound backward over the helix already wound on, but with a steeper pitch, so as to leave wider interstices between consecutive convolutions of the wire. This wire coil or nut is introduced into the hole formed in the wall for this purpose, it being slightly larger in diameter than the outer layers of wire, after which the surrounding spaces are filled up with plaster of paris, cement or similar binding material in a plastic condition. After the plaster or cement has thoroughly set and hardened, the bolt may be tightened enough to give it a proper bearing and tension.

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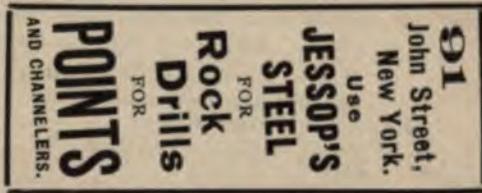
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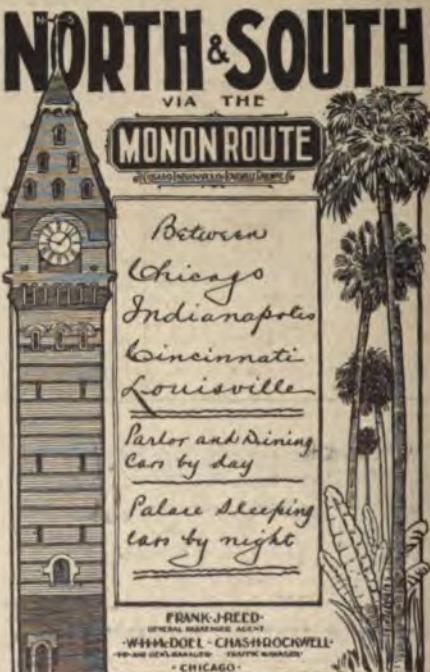
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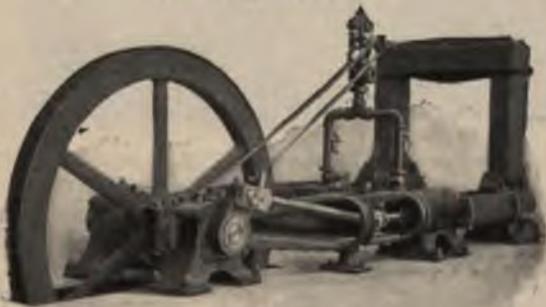
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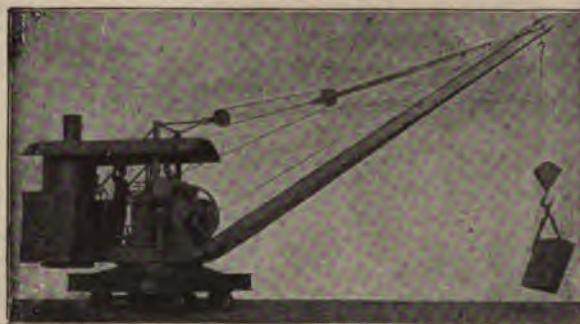
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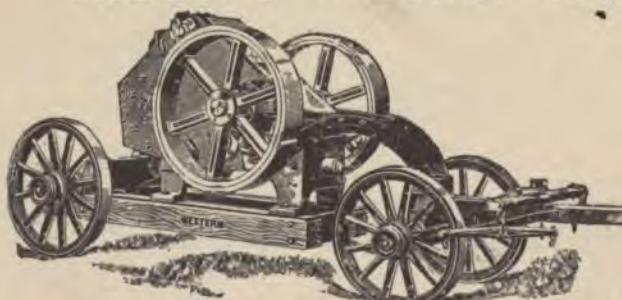
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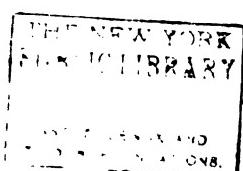
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THE BLUESTONE INDUSTRY OF NEW YORK.

BHE general business depression that began several years ago affected every branch of the stone industry. Many quarries shut down completely, but others kept along with curtailed production. The bluestone industry, dependent like all of the others, upon building activity and general prosperity, felt the hard times severely. Mill stock was in little demand and even city improvements languished so that flagstone was little called for. With the general improvement noted in every line of business during the past few months, bluestone producers have met with a renewed demand for their product. The stock on hand that had accumulated during the dull times has gradually been exhausted and now many of the large producers are working hard to fill orders. Quarries that were abandoned some time ago are being reopened, and many new ones are likely to enter the field before long.

Like all branches of quarrying, the bluestone industry has undergone many changes in recent years. The supplying of flagging for city paving forms, of course, a large proportion of the business. One only needs to cast a glance at the street pavement in the older part of any city to realize the different conditions that a few years have brought to the industry. Formerly what was most desired were flags containing only a few square yards in superficial area and two or three inches thick, at most. Why these were ever laid it is difficult to understand. If, by any chance they failed to crack and splinter they could not be made to keep level. But still they were called for in specifications and were conscientiously laid by honest contractors, although they were scarcely better or more durable than the plank-walks of the country village. Perhaps it was the difficulty of handling larger and heavier flags at the quarries and in the streets, that kept the small flags in favor so long. Content as long as they could get out these small stones with ease, the operators equipped their quarries with the most primitive appliances, and opened up only such beds of the stone as were of the required

thickness. The thicker beds that lay below were wholly neglected, and in many cases were covered with debris.

But in time city engineers and public works departments learned a lesson and grew more exacting. After the experience of generations they found that large flags of generous thickness made level sidewalks that would last. The old-time flags were relegated to the country, and those who would supply the cities must bring their products and their business methods up-to-date. This is being done in most of the quarrying centers and all new fields that are being exploited are opening with this fact in mind.

The term "Hudson River Bluestone" is used to designate the blue, fine-grained, compact and even-bedded sandstone, which is so largely employed for flagging and house trimmings in New York City, and to some extent in all of our middle Atlantic Coast cities and towns. The belt of country in which it is quarried, says a New York State report, is nearly one hundred miles long in New York, stretching from the southwestern towns of Albany county, across Greene and Ulster and the western part of Orange and eastern part of Sullivan counties to the Delaware River. In Albany and Greene counties it is narrow, as also is Saugerties in Ulster county, making the foot hills, as it were, on the east and east-southeast of the Catskill Mountains, and bounded on the east by the older limestone formations. It widens in the towns of Kingston, Woodstock, Hurley, Olive and Marble-



QUARRYMAN'S HOME WITH RUBBISH BANKS IN REAR, WEST HURLEY, N. Y.

town, and in them the quarries are distributed over the 500-foot plateau which borders the mountains on the southeast. To the northwest and in the valley of the Esopus Creek, many localities near the line of the Ulster and Delaware Railroad have been opened and worked. They are a part of the bluestone district geographically, although the geological formations are not the equivalent of the main belt at the southeast. There are scattering



OLD BLUESTONE QUARRY AT WEST HURLEY, N. Y.

localities in the towns of Rochester and Wawarsing and thence southwest, in Sullivan county, which furnish bluestone for local markets, and for exportation where they are situated near enough to lines of shipping.

The belt, as above described, has in it outcrops of shales and sandstones, belonging to the several geological formations, from the Hamilton period to and including the Catskill, in short, rocks of the Upper Devonian age. There are quarries along the Hudson River at New Baltimore, and thence southward, at Coxsackie and Catskill and near Rondout, but they are not in the typical bluestone, but in the sandstone of the Hudson River slate formation. The quarries of Palenville and vicinity, of West Saugerties, High Woods, Boiceville, Phoenicia, Woodland Hollow, Shandaken and Pine Hill, are above the horizon of the Hamilton formation and probably all in the Catskill group of rocks. The Oneonta sandstone which is the equivalent of the Portage group, may form a part of the belt near the foot of the mountains, but it is impossible to define its limits. The quarries at Roxbury and Margaretville and their vicinity, are in the Catskill formation. And the openings along the Monticello Railroad, in Sullivan county, are probably in the same horizon. The main bluestone belt, where it has been so extensively opened, as in the towns of Saugerties, Kingston and Hurley, is of the Hamilton period.

Beginning at the northeast, there are small quarries at Reidsville and Dormansville, seven miles west of the Hudson River and in Albany county. They have furnished a great deal of stone for flagging in the city of Albany. The stone of these quarries is gray in color and rather coarser-grained than the typical bluestone of the Hudson River quarries.

In Greene county there are several small quarries near Leeds, which are worked mainly for the Catskill market. In the vicinity of Cairo, stone is

quarried at several places, and shipped by rail. On the line of the Stony Clove and Catskill Mountain Railroad, and along the Kaaterskill Railroad, quarries have been opened from the mountain houses southwest to Phoenicia.

Ulster county is the largest producer of bluestone, and its quarry districts are the following: Quarryville, West Saugerties and High Woods, in the town of Saugerties; Dutch Settlement, Hallihan Hill, Jockey Hill, Dutch Hill and Stony Hollow, in the town of Kingston; Bristol Hill, Morgan Hill, Steenykill and West Hurley, in the town of Hurley; Marbletown, Woodstock, Broadhead's Bridge, Shokan, Boiceville, Phoenicia, Woodland Hollow, Fox Hollow, Shandaken, Pine Hill, and Rochester and Wawarsing quarries, in the valley of Rondout Creek and its tributaries.

There is much variation in the several quarries of these localities, both in the nature and thickness of the overlying earth or stripping, and in the number and thickness of the workable quarry beds. A large number of quarries have been opened, and at many places the valuable stone has been removed and the quarries abandoned. At other localities the thickness of the overlying earth and the long distance from transportation lines have prevented their further development.

The quarry beds range from an inch to three feet and, in some instances, up to six feet in thickness. The top beds are generally thin. In most cases these thick strata can be split along planes parallel to the bedding and the caplayer is raised by means of wedges. The size of blocks obtained is determined by the natural joints which divide the stone vertically. Stones 60 feet by 20 feet have thus been lifted from a bed. The facilities for handling and lifting really limit the size. The thicker stone are cut into curbing, crosswalk and sidewalk stones and large platforms, yielding what is known as flagstone. The thinner beds furnish flagging for towns and villages. A part of the thinner stone is cut into dimension work for water-tables, sills, lintels, posts and window-caps or house trimmings in general.

The stone obtained in these several districts varies in color, hardness and texture, and consequently in value, from quarry to quarry, and even in the same quarry. In nearly all of the localities the beds vary a little from top downwards; rarely is there much variation horizontally, or in the same bed. Hence, any given bed may be said to have a certain character, that is, produces a given grade of stone. The color is predominantly dark gray or bluish gray, and hence (more by contrast with the red sandstones) a "bluestone." Reddish-brown and some greenish-gray stones occur in the quarries higher in the mountain sides, as in the valley of the Esopus Creek, above Shokan, and in the Palenville quarries. There is a decided preference for the typical "bluestone" over the reddish or brownish colored grades. In texture the range is from the fine shaly or argillaceous to the highly siliceous and even conglomeratic rock. The best bluestone is rather fine-grained and not very plainly laminated, and its mass is nearly all silica or quartz, which is cemented together by a siliceous paste and contains very little argillaceous matter. Hence, the stone is hard and durable, and has great strength or capacity of resistance to crushing or compression.

The bluestone territory southwest of Ulster county is confined to a narrow belt crossing the towns of Mamakating, Thompson, Forestburgh and Lumberland in Sullivan county, and Deerpark in Orange county. And there are quarries near Westbrookville, near Wurtsboro, along the Monticello Railroad and on the Delaware River at Pond-Eddy and Barryville.

The principal shipping points whence bluestone comes to market are Malden, Saugerties, Kingston (including Wilbur and Rondout). A great



AN ULMER COUNTY MONOLITH.—SIZE, 20 BY 24 FEET; 9 INCHES THICK.

deal of stone is cut for house trimmings, in mills in Malden, Broadhead's Bridge, West Hurley, Wilbur, Kingston and Rondout, but the larger number of feet is sent into market simply quarry-dressed, for flagging and curbing.

So much for the geological and geographical aspect of the subject, the material for which has been drawn from the admirable reports published by the State Geological Survey and from the bulletins of the New York State Museum. In the present article I wish to dwell more particularly on the sandstone along the New York, Ontario & Western Railroad from Fallsburg to Norwich, on both sides of the railroad. This stone is light blue and rather coarse grained, but rubs to a very smooth surface and can be worked into mouldings much easier than the Ulster county stone. Its composition is largely quartz or quartzite, the grain being held together by silica. In fact it is a highly siliceous sandstone. All of the beds at the outcropping show it to be a first class weathering stone, not in any way affected by the severe frosts of winter and extreme heat of summer. The clay or shale between the beds make perfect partings and furnish parallel beds. In

this stretch of 150 miles, quarrying proper has been done in but few places, at Oxford more extensively than elsewhere. At Livingston Manor, Hartig & Johnson use hand derricks. At this place probably about one dozen openings have been made on the out-cropping, all looking for flagging, curbing, etc. When heavy beds are reached the openings are put down as being worked out. At Rockland and Roscoe probably more energy has been expended toward developing this stone industry than elsewhere along the Ontario & Western. And all of it has been done in the crudest form known in the quarrying business, no improved machinery having been used; hence the cost of production has been too great for profitable competition in the markets of the different cities. At Oxford some machinery has been used and the owners have made money, but heavy covering has been reached and improved methods must be taken up at once to make the working as profitable as it should be. Heretofore the exploration for quarries all along this line has been purely haphazard. Wherever an out-cropping has shown, no matter what the country was, men went to work to strip a block. They would quarry this out and perhaps a block or two more, and then they found themselves against a steep mountain side. The operators then called this quarry worked out, and pulled up their stakes to repeat the same operation elsewhere. This course has been followed all along the line, and in every hollow, even though it were from one to six or seven miles distant from the railroad near the tops of the mountains. Already there is indication of a disposition to change this method of operation. Experience and expert knowledge, together with a familiarity with geology, will be brought to the work along the railroad locating quarries within reach of side tracks, thus dispensing with nine-tenths of the hauling by wagon and reducing the cost of production at least 25 per cent. in this way and by the use of improved machinery. The valuable stone along this railroad is practically untouched. One season's work under proper supervision would locate many paying quarries, and there is no question that the New York, Ontario & Western would become one of the largest carriers of stone to the Eastern towns and cities.

The bluestone on the line of the Port Jervis, Monticello & New York Railroad is very hard, and is of the dark blue color that is considered so desirable. The railroad is partly in Orange and partly in Sullivan counties, making connections with the Erie at Port Jervis and with the Ontario & Western at Summitville. The main quarries are located in the line of the railroad between Rose's Point and Gilman's, a distance of about ten miles, on the west side of the Neversink River. There are also splendid quarries on the east side of the river, but they are not being worked to any extent, owing to the difficulty of shipping the output, as it is almost impossible to haul the stones to the railroad. Some of it, however, is brought to a branch of the railroad at Cuddebackville. The main quarries have been worked for a long period of years in the same desultory and unscientific manner that has marked most quarry work in this entire section. There have been no improved tools, no machinery, and no system. Instead of skilled labor, ordinary workmen have been employed. They would strip a block and take just about enough out to pay for the labor. No capital was back of the



SHIPPING DOCK ON RONDOUT CREEK, AT KINGSTON, N. Y.

business, and they had to live from hand to mouth. They were obliged to sell their stone to a few traveling purchasers, who took what they saw fit and left the rest on the quarrymen's hands. The natural consequence of this way of working is that the entire territory has been practically neglected for the past ten years. The best part of the stone is covered up with débris, and some of the finest blocks are buried completely out of sight. Undoubtedly this will all be changed in a very short time through the acquisition of the largest properties at Oakland by Dunn & Co., of New York City. These gentlemen have just taken hold of the quarries, and last month made their first shipment. They are endeavoring mainly to get the quarrymen to get out heavy four-inch flagging and curbing and other heavy stone for city use. They ship the stone to Cornwall, and from there it is lightered in their own boats to New York. About thirty men are employed at present.

At Rose's Point, the Jackson Brothers are quarrying in a small way, mainly to supply a local demand. They get out trimmings and lintels. All of the other quarries on the line of the railroad are practically at a standstill, and are not worked at this moment. Efforts are being made, however, to take them in hand with improved methods, and undoubtedly this entire field, which has lain idle for so many years, will be largely developed, thus again making the railroad the important factor in the stone business it was fifteen or twenty years ago, when the industry was controlled by Kilgore. There are other quarries on the line of the railroad, on its Summitville division. This stone is hauled to Westbrookville and Wurtsboro. In former years the stone was shipped by canal, but since the closing of the canal it is hauled by the railroad.

Another industry which is being developed on the line of this railroad is the exploiting of the enormous beds of calcareous shale, which makes an

admirable road material. Everyone who has ridden bicycles over the Port Jervis road to the Water Gap has commented upon the splendid condition of the roads, which are laid with this same material.

Mr. A. E. Godeffroy, the president of the railroad, is enthusiastic over the future of this road material. He controls a mile and a half face of the shale, and has just opened the deposits up for the market. It runs in all sizes; from a lump as large as a man's head to pieces the size of pea coal, and can be had in any size desired. Mr. Godeffroy has made several experiments with the shale in the past two years, and has constructed a highway of 250 yards in front of his place. This is as smooth as a park driveway, and has needed scarcely any repairs. He has made a contract with the village authorities of Monticello for several hundred carloads of the shale, which are now being delivered in the village streets. "This has not been rolled yet," said Mr. Godeffroy, several days ago, "but it will be rolled in two or three weeks, and this will give the village one of the finest highways in the State. Several other villages are negotiating for large quantities of the material and it will undoubtedly result in the opening of an entirely new industry. There seems to be no end to the deposits. I do not claim that this is proper material for either macadam or telford, used alone, but I do claim, and I can furnish proof of it, that it makes the finest top-dressing to be had anywhere. It only needs a little rolling to make it cement per-



BLUESTONE SAWING AND PLANING MILLS AT KINGSTON, N. Y.

fectly. Whether this shale can be shipped to New York in competition with the Tompkin's Cove road metal remains to be seen."

But this is a digression from the subject of bluestone.

It is impossible to say when bluestone first came into use for building and paving purposes. It is known that the stone was quarried in Kingston as far back as the first quarter of the century, but then it was merely put



J. W. LANE & CO'S QUARRY AT TYLER'S SWITCH, N. Y., O. & W. R. R.

upon the market for window sills and lintels. It was hauled by oxen over rough country roads, and finally was shipped by boat to New York. As the industry developed and as the use of the stone was widened by its application to paving, a plank road eleven miles in length was built through the quarrying country to Wilbur to facilitate the shipping of the stone. For the purpose for which it is used no better stone has ever been put upon the market. Its superiority for flagstone has everywhere been recognized. It is so compact as not to absorb moisture to any extent, and hence soon dries after rain or ice. Its grain prevents it from becoming smooth and slippery: it is so hard that it resists abrasion and wears well. Its strength against transverse pressure or strain makes it admirably fitted for lintels, window-caps, door-steps, water-tables, etc.

A test of stone from the Ulster County Bluestone Company's quarry gave the following result: Specific gravity, 2.751; weight per cubic foot, 171 pounds; ferrous oxide, 4.53 per cent.; ferric oxide, 0.79 per cent.; water absorbed, 0.82; loss in dilute sulphuric acid solution, 0.20 per cent.; alternate freezing and thawing unchanged; at temperature of 1200-1400 F. color changed to dull red, slightly checked and strength somewhat impaired.

Roscoe, N. Y.

JAMES B. GORDON.

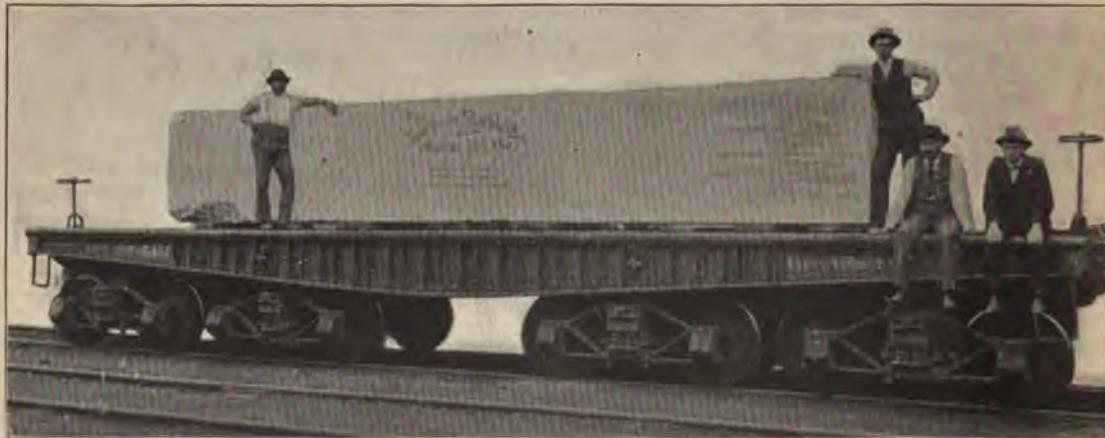


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SHIPPING A HUGE BLOCK OF MARBLE.

STONE has printed an account of the quarrying of several master monoliths of marble by the Southern Marble Company, Marble Hill, Ga. Incidentally, mention was made of the difficulty of transporting such huge masses of stone on a railroad. The quarrying and shipping of the monoliths have attracted general attention and have called out much comment. "The Railroad Gazette," of June 23, printed an engraving of one of the blocks mounted on a car ready for shipment. Through the courtesy of the "Gazette," STONE is enabled to reproduce the engraving. The "Gazette" says:

"The special car was one belonging to the Pennsylvania Railroad, one of two 4-truck cars, ordinarily designated as "gun cars." The car is built of iron, is 39 feet long, and weighs 53,700 pounds, which, added to the weight of the marble, gave a gross weight of 152,766 pounds. The shipment was sent over the Atlanta, Knoxville & Northern and the Western & Atlantic to Atlanta; and from Atlanta over the Southern Railway, the Pennsylvania and the New York, New Haven & Hartford. The marble was raised at the



HOW THE GEORGIA MONOLITH WAS SHIPPED.

quarry by a Lidgerwood hoist and it reached its destination without any trouble. Previous to this the largest single shipment of the kind we recall was one sent from Barre, Vt. That shipment weighed 26 tons and was peculiar in that it had to be placed edge upward and had to be let through the floor of the car to get it under the bridges. A second monolith has since been shipped over the A., K. & N., weighing approximately 50 tons, and several blocks of equal size will follow.

THE PRUDENTIAL BUILDING, OF ATLANTA.

IN the various publications that illustrate the architectural advances of the country, the examples of dwelling houses are chosen not only from the great cities, but from the smaller ones as well, and from the villages, the suburban towns and hamlets, and even the sparsely settled country. Indeed, the smaller places figure more frequently than the large cities, because they furnish more picturesque examples than can be obtained where the high price of land prevents the best possible architectural display. But in the illustration of business buildings, the subjects are drawn almost wholly from a few of the great centers, where the massing of population calls for huge structures of stone and steel that present interesting architectural and engineering problems. A foreign reader of our architectural journals might be pardoned for believing that the modern office building, in its best development, is to be found only in New York, Chicago, Boston and Philadelphia, or at most, in half a dozen other of the great cities. But every observing American knows that there is scarcely a city of fifty thousand inhabitants within the borders of the country but can show the most beautiful and creditable of modern business structures. Many of these are wholly original in design, sumptuous in appointment and perfectly adapted to the ends sought.

The editor of *STONE* has the pleasure of presenting this month an illustration of one of the finest office buildings in the country. This is the Prudential Building, of Atlanta, Ga., an engraving of which is given herewith. It is one of the richest and most striking structures in the South, and will stand comparison with any to be found elsewhere in the country. Imposing, simple and dignified in its design, the Prudential Building is exceptionally fortunate in its location. The site is one of the most valuable and desirable in the city. It is in the business center—directly opposite the Post Office and Custom House, and all of the street railroad systems of the city center near its doors. It has a frontage of 85 feet on Broad street, 178 on Walton street, 88 feet on Forsyth street and 178 feet on Custom House place. It is the only building in the city covering an entire block, and is ten stories high.

The building was designed by Mr. Thomas H. Morgan, of Bruce & Morgan, architects, Atlanta, in the spirit of the Italian Renaissance, a style most appropriate for the climate. The first three stories are built of Bedford limestone and gray brick, and above this rises five stories of plain wall surface, which support the enriched pilasters and cornices of the two top stories. The three principal entrances are of limestone beautifully designed and carved. The Bedford stone used in the construction was furnished by the Morton-Reed Stone Co., of Bedford, Ind. The contractors for the exterior cut stone work were the Ramsey-Brisbane Stone Co., of Atlanta.

The general contractor for the entire building was Mr. Grant Wilkins, of Atlanta.

The building is of the most modern fireproof, independent steel construction. The structural steel work was designed by Mr. Corydon T. Purdy, of Purdy & Henderson, structural steel engineers, New York City.

There are entrances from Broad, Walton and Forsyth streets, centering at the elevators, and forming a grand arcade through the center of the building from Broad to Forsyth streets. Among the most striking features of the building are the vestibules, which are handsomely finished, walls and ceilings, in Georgia Verde antique marble with mosaic floors. This rich marble came from the noted quarries of the Verde Antique Marble Company, 1245 Marquette Building, Chicago. The quarries that produce the marble are at Holly Springs, Ga. This same marble has been used extensively in the Custom House, at Savannah, Ga., and will be used for the ornamental work of the new addition to the Metropolitan Museum of Art, Central Park, New York.

The first story of the building is arranged for banking purposes, real estate or insurances offices, and attractive stores. From the second to the tenth story, inclusive, the space is divided into offices. Each office has direct outside light, and is provided with a marble wash bowl and an oak wardrobe. The wood finish is all selected oak. There are four high-speed passenger elevators with decorative wrought-iron screens, and one freight elevator. The building has a large electric light plant, and the plumbing and steam heating are after the most approved modern methods. There are two grand marble stairways to the second floor, and one in each end of the building from the second to the tenth floors, entirely removed from the elevators.

Last month STONE quoted an article from the "Stonemason," of Bristol, England, expressing wondering admiration at the extensive use made of marble in the office buildings of America. The present building would give added point to its remarks, for it is notable for the rich and effective display that has been made of the native marbles of the State. The Kennesaw Marble Co., of Marietta, Ga., furnished and set all of the interior marble work. Besides the vestibules, the walls and ceilings of which are of Verde antique, as noted above, the walls of the first story, pilasters, carved caps, pedestals, ceiling beams, stairways and telegraph booths are of Georgia white marble, which is also used for a wainscoting six feet high in all of the corridors from the second to the tenth stories inclusive. The wainscoting and closet partitions in the toilet rooms on the sixth and tenth floors, and the wainscoting and trimming in the barber shop on the tenth floor, are of Georgia white marble. All of the corridors throughout the building, the toilet rooms, barber shop and lavatories are tiled with white Georgia marble floor tile, while the floor of the vestibules is Roman mosaic. The entire marble contract was executed in an admirable manner and forms a splendid demonstration of the value of Georgia marble for decorative purposes.



THE PRUDENTIAL BUILDING, ATLANTA.

CANADA'S MINERAL PRODUCTION.

THE Annual Report for 1897 in the section of "Mineral Statistics and Mines" of the Geological Survey of Canada, has recently been published, making its appearance a little later than usual. This is the work of Elfric Drew Ingall, M.E., and his assistants, Theo. C. Denis, B.A.Sc., and J. McLeish, B.A. The report is a thorough and admirable one, and some of the statistics from it will be of interest to readers of STONE. These can be supplemented with figures from the annual preliminary statistical statement of the mineral production of Canada for 1898, prepared by the same officers, and just issued. It is understood, however, that these latter figures are subject to revision.

ABRASIVE MATERIALS.

In the line of abrasive materials, the production of grindstones, wood-pulp stones, etc., for 1897 was 4,572 tons valued at \$42,340, being an increase of 859 tons in quantity and \$9,030 in value over the previous year. The production for 1898, however, was only \$39,465 in value. There has been considerable variation in the industry, but the general tendency has been towards a decreased rather than an increased output, the production in 1887 and 1888, both in quantity and value, having been much larger than that of recent years. In Nova Scotia, operations are carried on principally by the Atlantic Stone Co., at Lower Cove, Cumberland, which employed last year an average of forty men. With respect to the work done at the quarry, Mr. Madden, deputy inspector of mines for Nova Scotia, says:

"This company exports most of the large grindstones, or 'waterstones,' as they are called, manufactured by them, to the United States. The stones manufactured by the company vary in size from six inches diameter by one inch breadth to 84 inches diameter by 15 inches breadth. Scythestones, holystones for use on board ship, and currier stones for use in tanneries, are likewise items in the manufacture at this quarry. All of these are manufactured from a blue grit reef 75 feet thick, composed of layers from one inch to 5 feet thick. The quarry is situated about four miles from the Joggins coal mines on the Cumberland Basin, with good shipping facilities."

The imports of grindstones for 1897 (not mounted and not less than 12 inches in diameter) were 1,521 tons, valued at \$25,547. The imports of buhrstones in blocks, rough or unmanufactured, for the same year were \$1,827.

ASBESTOS.

The production of asbestos and asbestite for 1897 was 30,442 tons, valued at \$445,368. For 1898 the figures are 23,785 tons, of the value of \$486,227. Only six mines were worked in 1897, and in some cases the work was intermittent or only consisted in prospecting, although large shipments were made from stock on hand. The largest known deposits of asbestos in America occur in the serpentines of the "Quebec group." The variety is therefore chrysolite. These serpentines are found in several places in the strip of the

Lower Silurian formation which extends from the boundary of Vermont to the extremity of the Gaspé Peninsula. Economic occurrences of asbestos, however, are restricted to two areas, one comprising the townships of Thetford, Coleraine, Ireland and Wolfeston, on the line of the Quebec Central Railway, and the other being that smaller area to the west of this district, at Danville, on the line of the Grand Trunk Railway, between Montreal and Point Levis.

The mineral occurs in small veins, distributed throughout the rocks, and mining is conducted in almost every instance by open quarrying, some of the workings being 120 feet deep. The blasted rock is submitted to crushing, and the asbestos is separated, sorted and graded, according to length of fibre by the aid of special machinery.

Asbestos is also found in some serpentines of the Laurentian area. In this case the mineral occurs in the serpentinized portions of crystalline limestone. In these occurrences, however, the proportion of the product which can be ranked as "firsts" is small as compared with the material obtained in the "Eastern Townships" of Quebec. The following is a list of occurrences known in the Laurentian rocks of Quebec, as gathered from the reports of officers of the Geological Survey, and those of the Mining Engineer of the Province:

Ottawa Co.—Templeton, VIII., 11, 15; West Portland, V., 15, 16; Wakefield, Bouchette; Lathbury, Denholm, I., 42.

Pontiac Co.—Calumet Island; Cawood.

Lake Temiscamingue—Duhamel Township, VI., 13, 14; VII., 17, 18. These last deposits are said to be worthy of further investigations.

Asbestos occurrences have been noticed in the Gaspé Peninsula, on the Dartmouth River, ten miles from its outlet, in an area of serpentine and limestone. The veins, however, are small and not numerous, and, from appearances, would not justify any expenditure for development.

To the north of the Chaudière River, in the vicinity of that stream, between St. Joseph and St. Francis, are several occurrences of small and irregular veins, but as far as examined these do not seem to have economic value. In Ontario there are no deposits of asbestos proper, though deposits of actinolite are known in Hastings County, in Elzivir and Kaladar Townships. These have been worked at intervals for a number of years. A specimen of asbestos (chrysotile), being part of a small vein of that material about half an inch in thickness, has been brought from the Stewart River, and rather coarse specimens of the same mineral from Forty-Mile, both in Yukon District.

Small veins of chrysotile have been observed in or near some of the deposits of serpentine contained in the Cache Creek rocks, especially in the vicinity of the Fraser River, between Texas Creek and Bridge River, and in the southern base of Mount Soues, near Junction Valley. It is possible that workable deposits of asbestos may yet be found in these rocks, but the specimens so far obtained are too small and too short in fibre to be of economic value. Specimens of a rather coarse and brittle variety of serpentine asbestos have been obtained at Thibert Creek, Cassiar. Finds of asbestos have also been reported from Trout Lake City, in W. Kootanie, and from the south

side of the Tulameen River, nearly opposite Bear Creek, but whether of economic importance in any case is not known.

GRAPHITE.

In the matter of the graphite industry, the total values of the different grades of product have varied much year by year, and up to 1896 the total production for any year never attained \$10,000 in value. There was great variation also in the average value per ton. This is owing to the varying quantity of the products of different years. Because of the confidential nature of the returns made only the gross totals are given, there being but few producers. Thus the values of all grades of product from the lowest to the highest have had to be lumped together, from material used for paint valued at \$5 per ton to the highest grade of finished graphite. There is a large increase in the figures for 1897, as compared with 1896, amounting to nearly 215 per cent. in quantity and nearly 72 per cent. in value, the average value per ton being less than half that given for the previous year. The figures for 1897 are: Tons, 436; value, \$16,240. The value for 1898, according to the preliminary report, reaches only \$11,098. The exports of crude graphite in 1897 were valued at \$2,488, and of manufactured graphite valued at \$1,339. The imports for 1897 were: Crude plumbago, \$1,406; black lead, \$17,863; plumbago crucibles, \$5,906; other manufactures of plumbago, \$14,768.

New Brunswick, Quebec and Ontario were the three contributors to the total production for the Dominion. The production in New Brunswick was of low grade material used in the manufacture of mineral pigments. In Quebec two mines and works were operated in the Buckingham district in Labelle County. These were the North American Graphite Company and the Buckingham Company.

GYPSUM.

The mining of gypsum in Canada during the year 1897 was confined to the provinces of New Brunswick, Nova Scotia and Ontario. According to the returns received from the various operators, there was produced, including the various products, viz.: Crude gypsum, calcined plaster, land plaster, plaster of paris and terra alba, a total of 239,691 tons, valued at \$244,531, an increase of 32,659 tons, or 15.7 per cent., and \$66,470, or 37.3 per cent. respectively, the greater increase in the value being accounted for by the larger proportion of the more highly manufactured material, plaster of paris included, in the 1897 total. The production of 1898 was 219,256 tons, valued at \$230,440, according to the preliminary report. A large proportion of the production of Nova Scotia and New Brunswick is exported, the crude material being sent to the United States to be manufactured into plaster of paris, etc. The exports of crude gypsum for 1897 was 189,206 tons, valued at \$197,150. The exports of ground gypsum were valued at \$6,763, a large falling off from the previous five years, in each of which the total exceeded \$20,000. The imports for 1897 were: Crude gypsum, \$772; ground gypsum, \$123; plaster of paris, \$4,489. The imports have largely fallen away during the past few years. Deposits of gypsum are numerous in Canada, but often too remote from means of communication to allow of being worked economically.

MICA.

Many deposits of mica are worked on a small scale by private individuals, and the figures for this industry are probably much below the actual production. The important deposits of mica worked at present are in the Province of Quebec. Ontario only counts in the production for a very small figure. The mica mined is almost exclusively of the quality known as "amber mica," which is used as an insulating material in the construction of electrical machinery. The greater part of the whole product is exported chiefly to the United States. The production for 1897 was valued at \$76,000, but the preliminary report for 1898 shows that the value for that year had risen to \$117,598. The exports for 1897 were \$69,101.

STONE AND STRUCTURAL MATERIAL.

The industries based on the structural materials are so widespread and are carried on in so many different places, on various scales and often intermittently, that the officers of the Survey declare it impossible to give anything like complete returns of quantity or value of the products. The production of building stone for 1897 is given roughly at \$1,000,000, the same as the previous year. The exports of wrought stone and marble for 1897 were \$9,415; unwrought, \$42,034.

The imports of flagstones, granite and rough freestone, sandstone and all building stone, except marble from the quarry, not hammered nor chiseled, amounted to \$27,442 for 1897. The imports of granite and freestone dressed, all other building stone dressed, except marble, were \$11,272. The imports of manufactures of stone or granite, not elsewhere specified, were \$34,026.

MARBLE AND GRANITE.

Various limestones having qualities entitling them to be ranked as marble are known to occur throughout Canada. However, the marble quarrying and manufacturing industry has never assumed large proportions, reaching only \$10,776 in 1890, the largest recorded in the report, while no production whatever is reported for 1897. The imports for 1897, however, were as follows:

Marble and manufactures of:

Blocks or slabs, sawn on not more than two sides.....	\$18,680
Blocks or slabs, sawn on more than two sides.....	30,009
Finished	6,205
Manufactures, not elsewhere specified	29,414
Rough blocks	1,842

Total marble and manufactures of..... \$77,150

Under the heading of granite would be included in trade terms much stone such as gneiss, syenite, etc., which would not be lithologically classed under that heading. The production for 1897 was \$61,934. This is the smallest amount for any of the twelve years recorded, the production in some years ranging as high as \$147,000. The production for 1898 was \$73,573. For 1897 returns were received as follows from the different provinces: In Nova Scotia, 5 operators contributed about 20 per cent. to the total production; New Brunswick over 40 per cent. with six operators; Quebec about

STONE.

28 per cent. with four operators, the balance being contributed by British Columbia.

SLATE.

The production of slate has steadily fallen off since 1893, being in 1897 less than half what it was in the former year, and about one-third the value of the production in 1889. The value of the product for 1897 was \$42,800 and for 1898, \$40,791. The main work done in exploiting the slate resources of the country was at the old quarries in Richmond County, Quebec, while a small quantity was sold by the Westminster Slate Co. in British Columbia, from stock in hand, their quarries having been idle. Recent efforts made with some success to develop an export trade in slate from the United States to Great Britain, appear to show that something of the kind should be possible in the case of the excellent slates of Quebec. There were no exports of slate in 1897, although the exports for the year before amounted to \$8,913. The imports for 1897 were as follows:

Slate and manufactures of:

Mantels	\$ 14
Roofing slate, black or blue	3,624
Roofing slate, red, green or other color.....	1,408
School writing slates	6,715
Slate pencils	3,052
Slate of all kinds and manufactures of, not elsewhere specified	6,802
Total	\$21,615

Small quantities of flagstones were produced at Bishop's Crossing, in Wolfe County, Quebec, and at Merriton, in Lincoln County, Ontario. There is nothing special to note about the industry. The output for 1897 was \$7,190, and the imports for the same year were \$227. The production for 1898 was only \$4,250.

CEMENT AND LIME.

Returns were received from nine manufacturers of cement, all of whom, with the exception of one in British Columbia, are located in Ontario and Quebec. Of the total value of the product Ontario contributed about 87 per cent., the balance being due to Quebec and British Columbia. The output of natural cement for 1897 was 85,450 barrels, valued at \$65,893, and of Portland cement 119,763 barrels, valued at \$209,380. The exports for the same year were only \$644. The imports of cement in bags or bulk were \$4,318. The imports of hydraulic cement were \$3,937. The imports of Portland cement were 210,871 barrels, valued at \$252,587. The production of lime for 1897 was \$650,000; the exports \$53,177, and the imports 16,108 barrels, valued at \$10,529.

The production of cement for 1898, as given in the preliminary report for that year, shows a considerable increase. The output of natural rock cement for that year was 87,125 barrels, valued at \$73,412; Portland cement, 163,084 barrels, valued at \$324,168.

THE SITUATION AMONG THE GRANITE CUTTERS



HE difficulties between the granite cutters and the quarry owners at Mt. Waldo, Me., have attracted general attention among stone men and builders, more particularly as the strike has had the effect of putting a stop to work on several large buildings in various parts of the country, where the Maine granite is being used. The situation becomes the more important as the granite cutters have removed their National Headquarters to Boston, and intimate that the strike may, in the autumn, involve the whole of New England. A correspondent at Rockland, Me., recently sent the following report to the Boston "Herald": "The cornerstone of Chicago's magnificent new \$2,000,000 post office may be laid in October, as planned, but enough Maine granite to make the walls of the superstructure will not be in that city for several years, at the rate things are going at the quarries in this section of Maine, and New York will also have to wait an annoyingly long time for the stone for the new Tombs prison and the East River bridge.

It looks as if the manufacturers, failing to operate their quarries as they ought to with Italians and others not belonging to the Granite Cutters' National Union will meet in the fall in Boston and declare a lockout to cover at least the whole of New England. This may not be necessary in case the experiment with Italian labor which has been in progress a month results successfully. The success of the Italians means a hard blow to the national union. Their failure means a harder battle between the manufacturers and the union which can end only in a lockout, a concession to the demands of the union or a compromise. The patience of the manufacturers has been sorely tried and they say they cannot do business at a fair profit if they pay more to the granite cutters than they are now paying.

The experiment of using Italian labor was begun June 1, by the Mt. Waldo Granite Works at Frankfort, whose president, Mr. John Peirce, of New York, is general contractor for the Chicago post office and other Governments and private works amounting to many millions of dollars. After this trial the company, while not wholly satisfied with Italian labor, is encouraged to believe that as more men come and become expert the cutting may be pushed ahead without dependence upon the national union.

The union men at Mt. Waldo went out on strike last September on account of the refusal of the corporation to grant an eight-hour day and a minimum rate of 45 cents an hour, or \$3.60 a day, as voted by the national union. The union intends to make a general demand all over the East next spring for the short day and this pay, and voted to begin on the stone for the Chicago post office, because the contracts for that structure would extend beyond that date.

The union rate of wages in Maine is 30 cents an hour and a nine-hour day, making the minimum pay \$2.70. This is paid in all the Maine quarries, and was offered by the Mt. Waldo corporation on the Chicago job. But the

men said no, they would work on anything but the Chicago post office for 30 cents an hour, but for not less than 45 cents an hour on the Chicago job, because the union had voted to make a test case of that.

If the Mt. Waldo corporation had agreed to do as the union wanted, there would have been presented the singular spectacle of two gangs of union cutters in their yard the men in each belonging to the same union, one gang receiving \$2.70 a day and working nine hours on general work, the other receiving \$3.60 that day and working eight hours on the post office job, and that arrangement would have continued in force until March 1 of next year, when the higher rate and the short day would have been general.

The quarrymen who blast and wedge out the rough blocks at the mountains, have no union, and are not concerned in the present controversy, except that their work stops when there are no cutters to dress the stone.

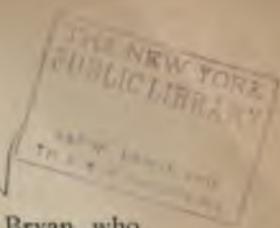
The quarry at Mt. Waldo is a mile from the wharf on the Penobscot where the granite is cut, and the material is hauled there by a wire cable tramway. The blacksmiths who sharpen the tools for the granite cutters are members of the cutters' union and are out on strike with them, but their number is comparatively small.

There are many Italians who are members of the national union, and are faithful union men as well as good workmen. The Italians who have been put to work at Mt. Waldo are men who either have not been in this country so long as the successful union men, or have been situated so that they have fared badly in competition with laborers of other nationalities.

Some of them left the national union, claiming that they were imposed upon there by better educated workmen, and all complained that on jobs in New York where political influence was a factor, they stood no show whatever, so they formed a union of their own in New York last March. This union is patterned after the national union in every respect; it has constitution and by-laws for the most part a straight copy except with the important modification that its members are willing to work nine hours a day and receive 30 cents an hour or more for it with eight hours on Saturday.

The national union brands this new union organization, which bears the name of "The Legal Granite Cutters' Union of the United States of America," as "unfair," and in notices sent out from the office of Secretary Duncan of the national union it is stated that they are got together and taken to a job under the padrone system. The Italians deny this, or at least their interpreters do, nearly all of the workmen being unable to talk anything but Italian.

The head man among them is a good-looking Italian named Peter Rinelli, a resident of New York. He says he has lived in this country twenty-five years. He is the only Italian who has succeeded in making himself understood perfectly at Mt. Waldo. He has some of the graces of an orator including a voice which may be heard by a large crowd, and in every respect he acts like a sharp, educated American who feels that he is master of the situation. He calls himself the walking delegate of the new union, and is said to be paid \$3.50 a day for his services with 50 cents additional when he goes ten miles or more away from New York City.



THE DIAMOND FIELDS OF BRAZIL.

THE Department of State has received from Minister Bryan, who represents the United States in Brazil, a report dated Petropolis, March 12, 1899. This gives an account of the visit of the Secretary of the Legation, Mr. Dawson, to the diamond and gold mines and agricultural regions of the State of Minas Garaes. Besides the general interest that this has, it calls attention to a promising field for American enterprise. The following are extracts from the report:

Diamantina lies 680 miles from Rio de Janeiro, and has from 6,000 to 8,000 inhabitants. As its name indicates, it is the capital and center of the principal diamond district of Brazil. It was founded in the last years of the seventeenth century as a gold-mining camp; in 1720, diamonds were discovered. These were at once declared State property by the King of Portugal, and for a hundred years mining of diamonds in Brazil was a Government monopoly. In 1832, the Brazilian Government legalized private mining. Before that time, the Government superintendents and contractors had worked the mines with gangs of imported slaves, and in a most short-sighted manner. The district shows the indelible results of such a régime. To this day there is an enormous preponderance of negro blood, and immense deposits of diamond-bearing gravel are irrecoverably lost, because they have been covered with detritus of other workings.

Four distinct kinds of diamond mining are practiced in the Diamantina district. The first is the most ancient and simplest. Near the top of the serra the small streams are very steep in their descent and have precipitous rocky sides. Their beds are filled with boulders, and in the interstices the diamond-bearing gravel is found. This gravel is called the "formacao," and is easily recognized by an experienced miner, for the reason that it contains minerals whose presence indicates the diamond. The diamond is a heavy mineral, its specific gravity being about 3.6, much greater than that of ordinary rock. When the mother deposits in the high serra were eroded and washed into the streams, the diamonds and other heavy minerals were separated from the bulk of the detritus by the action of the water. The heavy gravel thus left at the bottom and caught among the boulders is the "formacao." There are more than thirty minerals, some of which are always found in it. Among them are tourmaline, specular iron, disthene, rutile, gold and various phosphates. The "formacao" is prospected for in the dry season, and as soon as found is dug out and piled near by the water. When the rains interrupt the digging, the miners work up the gravel. The operation is very simple. The gravel is first washed in a "bacu," an excavation a yard wide and a yard and a half long on the bank of a pond or stream. Its lip is a few inches above the surface of the water and it deepens slightly to the rear. A cubic foot or more of gravel is placed in the back end and the workman dashes water against it out of a large concave wooden plate, giving it a peculiar rotary fling. This rapidly separates the lighter and larger stones from the smaller and heavier ones. When concentration by this rough method is as

complete as possible, the gravel is worked with the "batea." This unique instrument is a wooden dish about 30 inches in diameter, with a sort of pit at the bottom. Filling the "batea" with the concentrate and water, the workman agitates the contents, whirling and shaking them, meanwhile pouring and scraping the lighter gravel from the top as fast as he separates it. The operation is very similar to old-fashioned gold panning, but requires even greater skill, on account of the danger of losing diamonds. It is said that a man may be a first-rate gold panner and yet useless for diamond washing. At the end of the process, the diamonds are simply picked out by hand from the remaining minerals. Their peculiar luster makes them easily recognizable even by a tyro. The Brazilian method of washing alluvial gold is substantially that described above. By its use, practically all the diamonds and placer gold which Brazil has produced have been obtained. The native Diamantina miners know no better method.

At present the small stream washings in the Diamantina district are not important or productive. Two hundred years of search has exhausted most of them. Those who work them are usually men with little or no capital. They go in small parties and work somewhat at random, trusting to the chance of finding virgin gravel and making a rich haul. The rewashng of ancient concentrates of the old workings is also extensively pursued.

The second method of mining is that practiced in the beds of the larger streams. The opening of one of these mines is an extensive and complicated undertaking, requiring the employment of thousands of dollars and hundreds of men. At the beginning of the dry season, a spot is selected which is believed from tradition or ancient documents to be virgin. Just above the spot selected, a rude dam is erected and also a sluice around it, through which the waters of the river are turned. The bed thus exposed is usually found to be of sand, largely the detritus of ancient workings. This sand is carried out a shovelful at a time, in little wooden pans on the tops of negroes' heads. Naturally, such a process is tedious and expensive. The work could be done many times more cheaply and quickly with dump carts or even with wheelbarrows. From time to time attempts have been made to introduce them; but they have not been successful, owing to the conservatism of the native miners. The excavation is often carried to a depth of 30 or 40 feet before bedrock, where the "formacao" is to be found, is reached. The hundreds of workmen climbing the slopes of the hole in long lines, each balancing a pan of earth upon his head, look like ants following their paths in and out of a hill. The work is done in great haste, because the first considerable rains in September or October wash away the whole structure and fill up the excavation. The water that percolates into the pit is pumped out with rude pumps worked by overshot wheels, a portion of the river being diverted from the sluice for this purpose. These pumps are simply wooden tubes, in which work leather buckets opening upward. A stream of water is kept continually pouring down from the top to keep them running, otherwise they would not draw. The construction of the sluice, dams and wheels shows considerable primitive engineering skill. No nails or iron are used. The joints are mortised or bound together with vines. The builders have no idea of exact measurements, even the slope of the sluice being determined by the eye alone.

Nevertheless, such is their inherited skill that their work nearly always serves its purpose. However, they are unequal to difficult and novel problems. For example, one famous spot in the Jequitinhonha called the "Poco (pothole) de Moreira," reputed to be virgin and fabulously rich, was unsuccessfully attempted several times in the early part of this century. Every time before the bottom was reached the rains came and destroyed what had been done. A few years ago, Antonio de Lavandeyra, a Cuban engineer, by the use of modern methods and pumps succeeded in reaching and uncovering the bedrock. The practical results were a good example of the discouraging uncertainty of diamond mining. Only four diamonds were found. It is now believed that one of the early contractors, in the good old days before the "formacao" in the Jequitinhonha had been covered up with sand, had exposed or dredged the spot and taken out all the diamonds, and then had not thought it necessary to make any records of his doings for the Government or posterity.

The whole bed of this richest of all diamond rivers, from its source to Mendarha, some 50 miles below, has probably been worked. Below that point, the valley is too broad and the bed too much choked with sand to permit operations of the kind I have just been describing.

The gravel found is carried out of the excavation and placed in piles until the enforced leisure of the wet season gives a convenient opportunity to wash it. If the ground is virgin, the miners are likely to get a rich reward; if the gravel has been washed before, they lose all they have spent. The river mining is usually carried on by a local expert, who forms a company, to which his speculative neighbors and friends subscribe. No foreign capital is employed in it.

The third kind of diamond mining is from the "gupiaras," or deposits of gravel found on the slopes and sides of the valleys. The finding of these is largely a matter of chance. Some of them have proved wonderfully rich. From one, the "Gupiara da Lava-Pes," more than 160,000 carats were taken in one season. It covered an area of not more than six acres, and was probably the richest small deposit of diamonds ever found. Even this was not thoroughly worked over. Last year, two negroes doing a little casual washing on their own account one Sunday found 20 carats.

The fourth kind of mining is that in the conglomerates and beds of clayey rock which are found high up in the serra. These beds are almost certainly the source of the alluvial diamonds, in just the same way that quartz veins are the source of placer gold. Contraband miners discovered that they were diamondiferous. These daring fellows, mining by stealth and in small parties in the little streams, followed them up to their sources. To their surprise, they continued to find diamonds clear up to the top of the serra and finally in the country rock itself. The conglomerate or clay is, of course, far less rich than the alluvial gravel in which the gems have been concentrated by the action of water, but in compensation, the quantity is much greater. Much of it is hard and compact and difficult to work, but some is soft enough to wash away readily in running water. After the Brazilians had taken the diamonds out of the weathered surface, they proceeded to work the deeper deposits in the following manner, which is the only method they know.

They collected rain water in pools on the tops of the plateaus and led it by ditches to a favorable outcrop of the diamondiferous deposit, there cutting out great gullies in the soft rock. The action of the water separated the "for-macao" from the bulk of the débris, and this was further treated in much the same way as the alluvial gravel. This method was extremely slow and vexatious, because sufficient water for effectively washing away the masses of rock could only be collected a few days in each year. Ten working days is a good average for a twelve-month, and whole seasons pass without a single day's washing. Nevertheless, fortunes have been made in this kind of mining, and some of these "chapada" mines, as they are called, have been continually worked for nearly a century.

A French corporation, the "Companhia da Boa Vista," has recently purchased a large tract of conglomerate-bearing plateau where mines already existed, worked as I have just described, eight miles from Diamantina, and has undertaken its exploitation on a large scale and by modernized methods. Mr. A. Lavandeyra, an American citizen of Cuban birth, a graduate of the Troy Polytechnique School, and formerly one of the engineers of the Panama Canal, is the managing director in charge. Their conglomerate is found near the surface of the "chapada," or plateau, of Boa Vista at an elevation of 4,300 feet above the sea. The installation now being completed consists, briefly, of a reservoir on one of the higher levels of the plateau, the water from which is to be conducted by pipes wherever it is needed for washing. This reservoir is connected by a pipe 10 inches in diameter with another reservoir, half a mile away and 280 feet below the first. The latter is made by a dam across a small stream, which furnishes a constant supply of water sufficient for washing, but not large enough to run the pumps. These have a capacity of 90 liters a second and are operated by electric motors, which are connected by a wire running down the mountain side to a point 1,040 feet lower. Here is the power station in the valley of a large stream, the Santa Maria. The dynamos are operated by a 500-horse-power Pelton wheel, and this in turn by a pipe 20 inches in diameter, a mile long, and with a fall of 340 feet. It is supplied from a dam built across a narrow gorge of the river. The machinery for separating the diamonds from the washed conglomerate is specially constructed and was built in Europe.

This is the first and, so far, the only noteworthy attempt to apply modern scientific methods to diamond mining in Brazil. The engineering and practical difficulties which Mr. Lavandeyra has successfully surmounted have been very great. In engineering features, the plan is unique and original. The same conditions are to be encountered in no other kind of mining, and the methods of meeting them had to be thought out from the beginning. Even the diamond mining of South Africa affords no precedents. Skilled mechanics are unknown in the diamond district. Workmen have to be taught to use wheelbarrows or hammers and how to rivet pipes. There are no roads, and the miner must build his own. The difficulties of transporting heavy dynamos and castings on wooden-wheeled ox carts over mountain trails for more than 100 miles, are incredible. Ironworking, except horseshoeing, is unknown in that region, so repairs and changes are impossible to be made on the ground. The Boa Vista Company had the pipe cut in short sections and

brought up on mule back. The native miners are very incredulous as to the success of the enterprise. They can not understand how water can be carried in a little copper wire. Work was begun last March and is not yet finished. That the enterprise will be successful seems almost certain, unless the reasonable expectations of the company as to the amount of diamonds the conglomerates contain prove to be unfounded.

After describing the gold-mining, Mr. Dawson says of the other mineral resources of the district:

Next to the gold and diamonds, the manganese mines are at present the most important in Minas Geraes. They are near the town of Miguel Burnier, 311 miles from Rio de Janeiro on the Central Railroad. The ore is of good quality, containing 84 per cent. of oxides of manganese. It is extensively shipped to the steel mills of Europe and America, and these mines are among the most important sources of this mineral, so essential to modern steel making. The best known mine, the "Usina Wigg," shipped 20,000 tons to the Carnegie Steel Company, of Pittsburg, in 1896 and 1897.

Minas Geraes contains inexhaustible deposits of excellent iron ore; but the lack of coal prevents its being used, except for the manufacture of soft charcoal iron. Niter is found in considerable quantities in many localities. It has been commercially mined for over a century. Mica, graphite, topaz, beryl, chrysoberyl, andalusite, rock crystal, coal in thin seams, and building stone in great variety are known to exist in this State. Specimens of all these and of many others less important may be seen in the museum of the school of mines at Ouro Preto. Probably no part of the world contains such varied mineral wealth as the State of Minas Geraes. It is worth the practical investigation of American engineers and capitalists.



STONE MASONRY BRIDGES.

MR. OWEN MORRIS, C. E., built two highway bridges over Crum Elbow Creek, at Hyde Park, Dutchess County, N. Y., for Mr. F. W. Vanderbilt. Both of these were of the Melan concrete arch style, one of them faced with field stone and the other having a molded concrete finish. These bridges were described and pictured in the February number of STONE. Mr. Morris has given a technical description of his work and a copy of the contract and specifications for the bridges, in the "Michigan Engineers' Annual for 1899," just issued. He prefaces his paper with "A Few Remarks, Historical and Otherwise, on Stone Masonry Bridges," and we herewith reprint that portion of his article.

The Chinese seem to have known the arch from remote antiquity, and many of the variations in its structure seem to have been familiar with them. A traveler describes the construction of the Chinese arch thus: Each stone, from five to ten feet in length, is cut so as to form a segment of the arch, and in such cases there is no keystone; the curved stones are mortised into long transverse blocks of stone. (Barrow's "China.")

During the last few years several travelers have published accounts and illustrations of the true arch in the construction of bridges of remote antiquity in China, and of spans varying from thirty to fifty-four feet. An account has also been given of a stone bridge of one arch over the River Liffranyi of 600 feet span and 725 rise, authority not authentic. (Edinburgh Encyclopedia.)

Neither the ancient Egyptians, Assyrians nor Persians appear to have been acquainted with the true arch, although the arched form has been found in all parts of the world.

The useful application of the arch to bridge building was not known to the ancient Greeks, as when their architecture had reached its greatest perfection, the people of Athens were compelled to either wade or be ferried over the small river Cephisus, for want of a bridge. (Ency. Britannica.)

The oldest authentic account of the construction of the true arch is that of the entrance gates to the city of Khorsabad, Assyria, which were arched with voussoir arches of stone of spans from twelve to fifteen feet. (About 715 B. C.)

To the Romans must be given the credit of first communicating to the Western world the application of the arch to works of public utility.

The Ponte de Rotto, or Senator's Bridge, erected by Caius Flavius (127 B. C.), appears to have been the first instance of its application to bridges in Europe.

The largest stone arch yet erected, of which the record is authentic, was over the Adda at Trezzo, described as "consisting of a single arch of granite, very well constructed of stone in two courses, the innermost three and one-half feet thick in the direction of the radius, and the outermost nine inches, the span low water 251 feet." This bridge was destroyed by Carmagnola.

Another very remarkable structure is the Barbaruh Bridge over the Senderud, or "River of Life," at Ispahan, Persia. It has thirty-four arches of fifty feet span, is 2,250 feet long, 120 feet high and 156 feet in breadth, including parapets, with covered galleries on both sides, and a roadway 60 feet wide, battlemented and paved throughout. The superstructure is of Moorish design, but authorities say that the bridge arches and piers are several centuries older than the superstructure.

The Rialto Bridge, Venice, of one arch, 98 feet span, 24 feet rise and 72 feet broad, designed and built by Antonio de Ponte in 1560, is very often erroneously stated to have been designed by Michael Angelo: the mistake has arisen from the misinterpretation of a passage in the works of Vasari. The art of bridge building in stone seems to have been cultivated in Britain from a early period with success. The oldest structure of this kind there seems to be the Gothic triangular bridge at Croyland, in Lincolnshire, built in 860. This structure stands at the confluence of three creeks, or brooks (Welland, Nyne and Chatwater): it has three distinct roadways and approaches, formed by three segments of a circle, which, meeting in the middle, compose pointed arches, their abutments standing on the points of an equilateral triangle. Each abutment stands in a different county, one in Lincoln, one in Cambridge and one in Northampton. The triune nature of the structure has led some to imagine it was intended as an emblem of the trinity. In

boldness of design and simplicity of construction it is surpassed by no bridge in Europe.

The bridge over the Wear, at Bishop Auckland, Britain, built in 1388, is supposed to be the earliest example of a segmental arch bridge. It has one span of 100.42 feet and a rise of 22 feet, and another of 91.42 feet with a rise of 20 feet.

The first circular arch oblique bridge in stone appears to be the one built by Nicoli over the Nugnone near Porta Sangallo at Florence, Italy. Several old examples of the oblique arch are to be seen at Cordova, Spain.

The first elliptical arch oblique bridge (built in 1760) is that at Trilport-on-the-Main. The center arch is 81 feet, and the end ones 76, 75 feet span.

The oldest existing stone bridge in Europe is a rude stone beam or lintel. This bridge is over the East Dart, near Dartmoor, Britain, supposed to be 2,500 years old (is known to be fully 2,000 years old), and coeval with Stonehenge, the famous temple of the Druids. The piers are formed of large granite blocks, and each of the granite slabs forming the roadway is about 15 feet long and 6 feet wide.

The highest masonry arch in the world is the aqueduct of Spoleto, in Central Italy (built in 741 A. D.) ; its height from top of water to parapets being 426 feet and span 70 feet.

The longest stone bridge in Britain is the one over the Trent at Burton. It is 1,550 feet in length, has 36 arches, and was built in 1146 by the fraternity known as the "Brethren of the Bridge," a society originally formed by monks in France for the purpose of building bridges.

The stone bridges in Europe are numerous and beautiful, but space will not allow me to describe them further.

There is, however, one bridge which, as a monument of the patience, industry and talent of its remarkable engineer, I cannot pass over in silence. This bridge is probably the most extraordinary of any in Britain. It is thrown over the River Taff at Pontypridd, Glamorganshire, and was erected by William Edwards, an uneducated mason of that county, who acquired the principles of masonry by rambling through the ruins of a Gothic castle in his native parish. It was built in 1750, after the failure of two structures which he had previously erected at the same place. The first, of three arches (built in 1746), was carried away by a great flood after standing two and a half years, and the second (built in 1749), of one arch, 140 feet span, failed in consequence of the false work being removed before the parapets were erected or the ground filled in behind the abutments, the weight of the haunches forcing out the keystone. The present structure, which is still in perfect condition, consists of a single arch with a span of 140 feet and a rise of 35 feet. The outer or showing arch stones are 2.5 feet deep and that depth is made up of two stones. The inner arch stones are but 1.5 feet deep, and 6 to 9 inches in thickness, quarried with tolerably fair beds, with little or no dressing in addition, set in mortar made from Aberthaw lime, which makes one of the best natural cements in use even to-day. This important fact has not been noticed by most of the authorities who have written about this bridge, Trautwine included.

Edward's performance gave, as it were, a new impulse to bridge building in Europe. He built several other bridges, and improved his work each time, forming his arches of segments of much larger circles, and was in fact the first builder of a really flat segmental arch in Europe.

The largest span masonry arch built of sandstone is that built by Messrs. F. L. Hoge and A. L. White, at Wheeling, W. Va., in 1892.

TABLE OF SOME STONE MASONRY ARCH BRIDGES.

Where there is more than one arch, the span refers to the largest one in the bridge.

Bridge.	Engineer.	C. Circular.	E. Elliptic.	Number of Arches.	Span in feet.	Rise in feet.	Breadth, including parapets, in feet.	Depth of actual Keystone.	Date of construction.
Adda, Italy—Duke of Milan.....	C.	I	251				26	4.50	1377
Cabin John, Wash.—Meigs.....	C.	I	220	57.2	32		4.16	1859	
Grosvenor, Chester, Eng.—Hartley.....	C.	I	200	42	33		4.00	1821	
Vieille, Brioude, Allier, France—Grenier.	C.	I	183	70	16		5.00	1455	
Jaramze, Austria.....	C.	I	213	59					1892
London Bridge, Eng.—Rennie.....	E.	5	152	29.5	56		4.75	1831	
Ballockmyle, Glasgow, Eng.....	C.	I	180	58	34.4		5.00		
Wheeling, W. Va.....	C.	I	159	28.4					1892
Gloucester, Eng.—Telford.....	E.	I	150	35	35		4.50		
Dora Riparia, Italy—Mosca.....	C.	I	148	18			4.92		
Pontypridd, Eng.—Edwards.....	C.	I	140	35	15		1.50	1750	
Den Bunn, Eng.—Telford.....	C.	I	130	29	43		4.25	1806	
Seine, Neuilly, France—Perronet.....	C.	5	128	32	48		5.25	1773	
Waterloo, London, Eng.—Rennie.....	C.	9	120	32	48		5.00	1815	
Loire, Orleans, France—Hupeau.....	C.	19	106	30	49		4.60	1760	
Dean Turnpike, Eng.—Telford.....	C.		90	30	33		3.00		
Pons Milvius, Italy—Scaurus.....	C.	7	80	29	28		4.50	100	
Falls Bridge, Phila. R. R., Pa.....	C.		78	25	34		3.00		
Hyde Park, N. Y.—Morris.....	C.	I	70	7	28		3.00	1898	
Chestnut St., Phila., Pa.—Kneass.....	C.		60	18			2.50		
Monocacy, O., Canal—Fisk.....	E.	I	54	9			2.50		
Senderud, Ispahan, Persia—Barbaruh....	C.	34	50	25	156		3.00		
Phila. & Reading R. R., Pa.—Steele.....	C.		44	8			2.50	1882	

PRACTICAL STONE-CUTTING.*

CHAPTER XIX.—Plate 18.—Explanation of the "TANGENT SYSTEM METHOD" by means of which the Bed, Joint, and Face moulds may be developed, together with directions showing their application in practice at the banker, as required in order to bring to the desired shape the upper piece of coping, the plan, etc., of which was first given in Fig. 1, Plate 15.



In the problem explained in the two preceding plates, the rise of the coping is placed over the one plan tangent, viz., the upper one. Here it is placed over each one, but it may be well to state that the rise is not an equal one; that is, the rise of the coping is greater over the upper tangent B'-C of the plan, than at A-B' the lower one. The problem here given is, therefore, very similar to that given in the diagrams of plate 11, to the explanation of which we refer our readers. It may be noted that the directing plan ordinate S-A of Fig. 3, Plate 11, forms an

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obtuse angle with the tangent A-B. In Fig. 1 of this plate it is at right angles, but the same method of construction may be made use of for developing the moulds, etc., as here required, as are explained for the similar operations in Plate 11. This understood, the student will proceed to draw the curves of the plan, fac-similes of those given in Plate 15; then divide them as shown in 7-3-5, etc., into any number of parts; then produce the tangent C-B' indefinitely, and parallel with it draw C''-A'' of any length (or the construction may be made as in Fig. 3, Plate 11, upon the tangent line directly). Then square with C''-A'', draw C''-C', and B'-B''; set off C''-C' equal to the total rise, 1-5 $\frac{1}{2}$, of the coping; make C''-U equal with the rise Z-Y of the coping over the lower tangent, as given in Fig. 2, Plate 15. This, with a scale of equal parts, will be found equal to 7 $\frac{1}{4}$ inches. From U parallel with C''-A'' draw U-B''; joining C'-B'' produced, the pitch line of the coping may be projected. Now joining A''-A the position of the level directing ordinate of the plan may be obtained. Parallel with this draw the ordinates of the plan, meeting the pitch line as shown in the points W-A''-D, etc. In Fig. 2 set off W-A-D, etc., equal to those given in W-A''-D, etc., of the pitch line Fig. 1; and from each point square over lines as shown. Make the length of these equal respectively to that of the corresponding plan ordinates, and trace the curves, and project the tangents A'-B-C, and square with them draw the joint lines 1'-2, 9-10; to the directions already given for the similar operations in preceding plates.

To project the tangent and joint lines of Figs. 3-4: Set off 9-J and 10-J respectively equal with A''-C'' of Fig. 1; join C-J, which gives the tangent line, then drawing T-R square with C-J, the joint lines of the upper surface may be projected. Now set off 9-D and 10-D equal with C''-U, the rise of the coping over the lower tangent of Fig. 1, and parallel with 9-7 and 10-8 draw D-F; now make 7-E and 8-E respectively equal with A-B' the length of the plan tangent, and square up E-F; join F-7, and F-8 gives the tangent line; then G-I squared with it gives the joint lines of the lower surface.

Now to construct the "plumb" bevel and find section as required at the lower joint surface: First, in Fig. 2 square with W-C draw 1'-1 and 2-2. Then in Fig. 1 set off R'-P-N equal with 1-A-2, of Fig. 2. Parallel with C''-A'' draw P-Q and N-O. Now at the joint line 7-8 of the plan, set off D-A equal with C''-U, the rise of the coping over the tangent A-B'. Join D-B', and square with it draw D-c; then make D-Q'O' equal with R'-Q-O above; parallel with A-B' draw Q'-b and O'-c; now turn to Fig. 2, set off 2-b equal with D-b of Fig. 1, joining A'-b the position of a level line at the joint surface may be obtained. Or set off 2-c equal with D-c of Fig. 1, and with 1' as center and the width (1'-6'') of the coping as the radius draw an arc in c; through the intersection draw 1'-c which gives the direction of a level line at the joint surface; this latter is perhaps the better method to employ as it gives a longer direction or line, with which to draw the direction of the plumb line A'-S. Having obtained the direction of the "plumb" and "level" lines, the right section of the coping may readily be projected by means of the method fully explained for the like operation in preceding plates. Having completed the diagram with a scale of equal parts it will be found the length

PLATE 18.

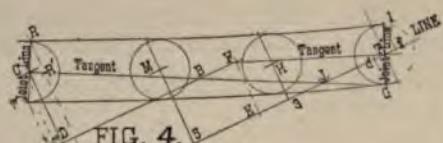


FIG. 4.

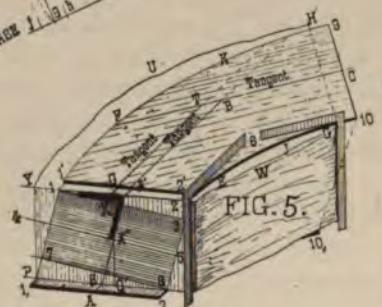


FIG. 5.

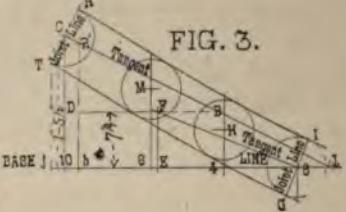


FIG. 3.

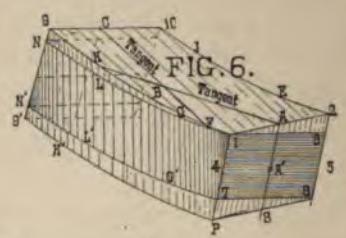


FIG. 6.

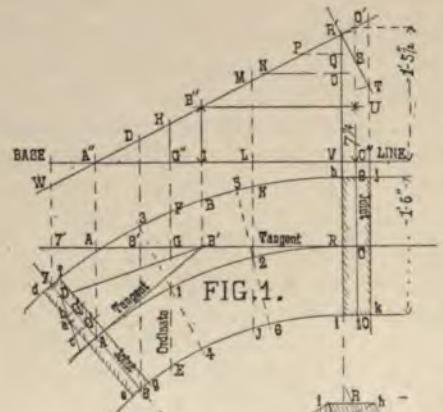


FIG. 1.

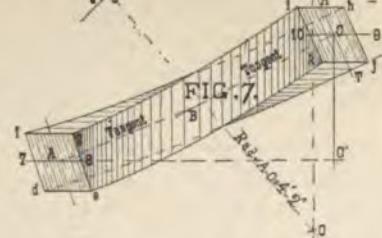


FIG. 7.

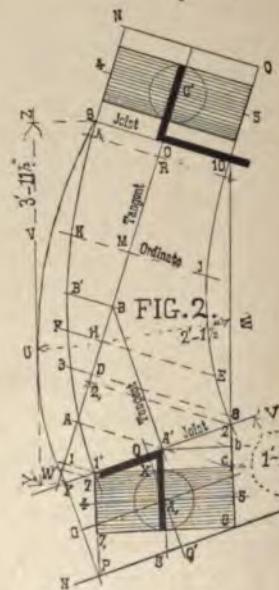


FIG. 2.

C. H. Fox, Jr.

of the required rough stone is equal to $3'-1\frac{1}{2}''$, the width $2'-1\frac{1}{2}''$, and the height $1'-1''$; total cube contents equals $9'-1''$.

Having selected a stone of the required size, proceed as directed for the like operation at Plates 12 and 16, and work the top surface. Then upon it mark the joint and tangent lines of the bed mould, Fig. 2; then cut the joint surfaces, making use of the "square," as shown in Fig. 5, to give the proper direction for forming the surfaces in question. This done, mark upon the surfaces the lines $Q-Q'$ of the lower, and $C-C'$ of the upper joint. These are drawn at right angles with the working surface. Find the center points $A'-C'$. Then through them draw the plumb lines $A,-A'$ and $C,-C'$. Now parallel with the tangent line $Q-T$ of Fig. 5 first drawn at the working surface draw $A'B$. This gives the direction in which to apply the bed mould in order to obtain the proper direction in which to transfer to the working surface the curve lines of the mould. The same operation requires to be repeated at the lower working surface. This done, proceed as directed for the similar operation in the plates above mentioned and form the cylindrical faces of the coping. Then upon these mark the face moulds of Figs. 3-4, which gives the direction for forming the top and under twisted surfaces. We have in plates preceding explained the method of cutting the stone, so that a repetition here is unnecessary. The principal operation consists of drawing in a proper manner the "square lines" upon the joint surfaces, and in the finding of the center points of the joint; then through these drawing the "plumb lines," and to their direction drawing upon the working surfaces the tangent lines over which the bed mould may be applied at its second application. The method of drawing the curves and of cutting the stone will suggest itself to any ordinary stonemason.

C. H. Fox.



SLATE TRADE IN FRANCE.



N the June number of STONE there was given a series of reports concerning the slate trade in Europe, made to the State Department by American consuls. The following additional report has been made on "The Slate Trade in France."

Slate is used here for window shelves and window tops, steps of indoor and outdoor staircases, kitchen trimmings, and finishing. The slate used for this purpose is brought here from Lavagna, on the Ligurian Riviera, and is a dark-gray article of what I should consider a remarkably inferior quality. I have made a number of inquiries among architects and others touching this slate, and have ascertained that it is not durable and very soon goes to pieces. Taking into consideration the very mild climate here and the entire absence of severe frosts, it may safely be asserted that it would be absolutely useless in our Northern States. Along the Ligurian Riviera it is used for roofing purposes, of such a thickness that it seems to the traveler to consist of slabs of dark-gray stone. I have not been able to ascertain the price at Lavagna, but the charges upon this slate are as follows:

STONE.

Description.	Charges per 1,000 kilograms (2,204.6 pounds).		
	Francs.	Nice.	Lavagna.
Cost of transportation by sea to Nice.....	11.00	\$2.12	
Duties	40.00	7.72	
Octroi (municipal duty)	3.00	.58	
Cartage from dock	2.50	.48	

As far as I can ascertain, slate in the rough is sold as follows:

Description.	Price per square meter (1.19 square yards).			
	Francs.	Nice.	Lavagna.	Francs.
15 millimeters (.59 inch) thick.....	4.35	\$0.84	1.80	\$0.35
25 millimeters (.98 inch) thick.....	7.80	1.51	3.00	.58

Roofing slates from Angers, France, are coming into more general employment here, although up to the present, the large and heavy terra cotta tiles have been in universal use. I note that slate tiles have been used lately upon several large villas.

Roofing tiles from Angers, machine cut, cost 52 francs (\$10.04) per thousand; with side rounded, 62 francs (\$11.97) per thousand.

The Lavagna slate is sold as follows:

Description.	Price.
Francs.	
For balconies:	
0.9 by 0.94 meter (35.4 by 37 inches).....per lineal meter..	10.50 \$2.03
0.95 by 0.29 meter (37.4 by 11.4 inches).....each..	2.50 .48
Window shelves, with cut step to stop window shutter in closing:	
1.2 by 0.2 to 0.25 meters (47.2 by 7.8 to 9.8 inches).....each..	2.40 .46
0.95 by 0.2 to 0.25 meter (37.4 by 7.8 to 9.8 inches).....do..	2.10 .41
Same, without step to stop window shutter:	
1.2 by 0.22 meters (47.2 by 8.6 inches).....do..	1.75 .34
0.95 by 0.22 meter (37.4 by 8.6 inches).....do..	1.40 .27
1.2 by 0.3 meters (47.2 by 11.8 inches).....do..	2.70 .52
0.95 by 0.3 meter (37.4 by 11.8 inches).....do..	2.25 .43
Window tops with molding:	
1.1 by 0.2 meters (47.2 by 7.8 inches) .....do..	1.40 .27
0.95 by 0.2 meter (37.4 by 7.8 inches) .....do..	1.25 .24
Steps:	
1.18 by 0.29 meters (46.4 by 11.4 inches) .....do..	3.00 .58
0.95 by 0.29 meter (37.4 by 11.4 inches) .....do..	2.50 .48
Irregular shape, by 0.29 at center.....per lineal meter..	4.50 .87
1.18 by 0.35 or 0.33 meters (46.4 by 13.7 or 12.9 inches) with under support (back support) .....each..	5.00 .97
Same, 0.95 instead of 1.18 meters.....do..	4.00 .77
Same, irregular shape, 0.29 meter at center.....per lineal meter..	5.50 1.06

The following are the customs duties upon slate entering into any port in France:

Description.	Duty per 100 kilograms (220.4 pounds) gr. weight.	
	Francs.	Cents.
Slabs of all kinds, cut or sawn, rough or polished.....	4.00	77
Slate tiles for roofs	1.40	27
Framed or unframed slates for school purposes or blackboards.....	5.00	96.5

I have heard that at Saint Sauveur, a hamlet about 6 or 7 kilometers (3.7 to 4.3 miles) distant from La Tinée, a station on the Southern Railway, there are strong surface indications of the existence of dark-purple slate. Nothing is being done to develop it. Even if the quality were good, I am sure that the very expensive transportation would prevent its use.

It might be worth while to forward samples to F. Repossi, Commission, Rue d'Amérique and Place Washington, Nice. This gentleman is working hard to create a direct importation of American products, under the surveillance of my vice-consul, and if sufficiently encouraged, he intends to open a large sample room of American goods exclusively, with the object of developing a direct import trade from the United States by sea.

HAROLD S. VAN BUREN,

Nice, May 8, 1899.

Consul.

SLATE TRADE IN RHEIMS.

Consul Prickitt, of Rheims, has written as follows, under date of May, 20, 1899:

The cost of roofing slate, laid down in Rheims, is, for the best qualities, 24 francs (\$4.63) per thousand. The size of the pieces is approximately 12 by $7\frac{1}{2}$ inches. As laid here, it takes 54 pieces to cover a space 39 inches square. This slate weighs 350 kilograms (770 pounds) per thousand. The duty on roofing slate in France is 1.40 francs (27 cents) per 100 kilograms (220 pounds). Polished slate is charged 4 to 5 francs (77.2 to 96.5 cents) per 100 kilograms. The principal slate quarries of this district are at Fumay and Signay le Petit. The slate of Fumay is the most valuable, being of a beautiful violet color and having a fine grain. Heat and cold do not affect it. It sells for about 2 francs (38.6 cents) more a thousand than the roofing slate from other quarries. The principal dealer in this city is Victor Druart, Chaussee du Port, No. 37. Slate is exported from France in large quantities, and but little is imported. It is used in this country chiefly for roofing. I do not think this market promising for the introduction of roofing slate from America.



Comment on Timely Topics

AS OTHERS SEE US.

THE "Illustrated Carpenter and Builder," of London, is one of the best papers of its class published anywhere. Its comments on American affairs are, as a general rule, intelligent, just and kindly. Its editors and contributors seem to have a wider knowledge of American affairs than is usual with many who conduct foreign trade periodicals. These facts make all the more remarkable an article published in a recent issue on "Marble and Granite in the United States." The subject is so important and the standing of the paper so high, that it seems to be the duty of STONE to quote the friendly comment and correct the writer. The paper says:

"The marble and granite quarried in the United States almost exclusively supply the facings to public buildings, the material for stairs, windows, door lintels, and other architectural purposes. Granite is worked in the northern part of the country at Quincey, in Massachusetts, and at Singsing, in the State of New York, and also in New Hampshire. The Quincey granite is of a fine gray colour, and can be quarried in large blocks. It has been used a good deal in Boston and the neighbouring country for architectural works. It has also been employed for railway blocks and in the construction of graving docks, &c. The Singsing granite, which is of dark gray or bluish color, is quarried on the banks of the Hudson. In the neighborhood of Boston and Philadelphia a species of soapstone is found, and is used in situations exposed to high temperature instead of fire brick. To the marble quarries, however, the Americans look for their principal supply of materials. These are more numerous and are more widely distributed than the others, although they are confined to the Northern States. The principal marble quarries are in the States of Pennsylvania, Massachusetts and Vermont. The marble quarries in Pennsylvania are situate in the valley of the River Schuylkill, and are from thirteen to twenty miles from Philadelphia. They produce white, blue and variegated marbles. Limestone is found resting on the marble, and is blasted off with gunpowder and burnt for making mortar. In some of the quarries the beds of marble dip from north to south at an inclination of sixty degrees with the horizon, and consequently are worked at a considerable disadvantage.

"The Massachusetts quarries produce white and blue marbles, and the Vermont quarries black and white marbles. The marbles of the United States are not suited for sculpture or very fine ornamental works, or even for the capitals of columns, which require superior workmanship, and the marble used for the capitals of all the fine buildings throughout the country is im-

ported from Carrara. For similar purposes it is also imported from Ireland, but it is doubtful whether there is any real necessity for this were the American quarries efficiently worked. Those buildings which are constructed of the whitest description of American marble carefully selected for the purpose, such as the Capitol and the President's house at Washington, the Bank of the United States, the Mint, and other public buildings at Philadelphia, and the monument erected to the memory of Washington at Baltimore, have certainly a most imposing and gorgeous appearance, owing to the fineness and beauty of the material. But the buildings which are constructed of the blue or unselected marble, such, for example, as the State Capitol at Albany, or the Town House at New York, have a bloated and dingy look, and the general effect produced by the marbles in these buildings is greatly inferior to that of some of the sandstones from the British quarries. The white marble retains its purity of colour much longer in the United States than it would do in this country, owing to the clearness of the atmosphere and the absence of smoke. These circumstances may also account for the seemingly permanent vividness of the various colours, such as red, white, brown, yellow and green. An English engineer, travelling in America, mentions a quarry in Pennsylvania where the men were working a bed of white marble 14ft. in thickness, at a depth of 120ft. below the natural surface of the ground. The blocks, some of which weighed twelve tons, were raised to the surface by means of a rudely-constructed horse gin, there being no road to the bottom of the quarry, or rather pit. Although this is no doubt altered now, it may be remarked that this system is similar to that practised at the celebrated sandstone pits of Caen, which produced the materials for the old London bridge."

From first to last there is scarcely one sentence in this that is absolutely correct. What are not untruths are half truths. While marble and granite are extensively used for the purposes indicated in the opening sentences, yet to say that they almost exclusively supply the facings to public buildings is little short of ridiculous, when one considers the use that has been made in the past and is still being made of Bedford and other limestones and the many varieties of sandstones. No stone has been more widely used for window sills, lintels and other purposes of this sort than bluestone. The second sentence is equally as far from the truth. An article devoted to granite in the United States, which specifies only the quarrying at Quincy, Sing Sing and in New Hampshire, gives foreign readers a poor opinion of the granite producing capabilities of this country. Sing Sing granite is scarcely heard of in these days. All of the granite found along the Hudson River is what is known as a bastard variety, and is of such a nature that it is not profitable to work. It is used mainly for railroad purposes, and has been applied to the facing of buildings to a very limited extent in any part of the country. Some twenty-five years ago quite a little was used, but on account of its weathering qualities and the fact that it lost color, it was generally discarded. The Connecticut granites, including the Milford pink and the favorite Stony Creek varieties, and the Rhode Island granites of Westerly are all widely used and will compare with the best of European granites. The Richmond granites of the South are also thought highly of in many parts of the country. It would

be interesting to learn where such a valuable stone as Quincy granite has been largely used for railroad work. Outside of the United States, too, there are red granites from New Brunswick equal to the best of the Scotch granites.

It is amusing that reference should be made to the use of soapstone for architectural purposes. Wherever this has been employed it has been to the most limited extent. The Chester greenstone of Chester, Pa., might perhaps be called a bastard soapstone, although it is really a serpentine. This is largely used for broken ashlar in church work. But it is in reference to the marbles that the writer of the article displays the greatest want of accurate knowledge.

Why one should make the first and most important reference of all to the Pennsylvania marbles, then take up those of Massachusetts, and finally give but a line to the marbles of Vermont, is past comprehension. There are very few marbles in Pennsylvania, the leading one being the Avondale. Massachusetts marble is good, what there is of it, but the State ranks below many others in its marble output. No reference whatever is made to the fine marbles of Gouverneur, N. Y., and of Tuckahoe, and to say that our productive marble beds are confined to the Northern States leaves wholly out of account the magnificent deposits in Georgia, Tennessee and the far West, to say nothing of the beautiful Virginia marble beds which are just beginning to be worked. The writer limits the Vermont quarries to the production of black and white marbles, making no mention of the beautiful blue, green and other colors in almost endless variety. While no one would claim that the United States marbles are as suitable for statuary work as the Carrara product, the point of the statement is lost by declaring that marbles for the capitals of all the fine buildings throughout the country are imported from Carrara. Only the smallest per cent. of the imported stone is ever used for this purpose, and Irish marble is employed in interior decoration only when it is particularly specified in contracts, and that is very infrequently.

The reference to the State Capitol at Albany and the "Town House" at New York, carry little weight. The Albany Capitol, of course, is built of Hallowell, Me., granite, and the writer undoubtedly intended to specify the old State Hall, an unimportant building of small architectural pretensions that was built many years ago. This is one of the few public buildings constructed of Sing Sing marble. It is interesting, in this connection, to refer to the statement made by Mather in his State Report, years ago, in which he says: "Many blocks of this rock were brought to Albany for the construction of the new State Hall that were already crumbling; but whether they were put in the structure, or rejected by the builders, as they ought to have been, I do not know." Doubtless they were rejected, as the building has stood fairly well, considering the rigors of the climate.

The final point made by the writer in "The Carpenter and Builder," giving the observations of an English engineer on the methods of operation in a Pennsylvania quarry, would seem to indicate that American quarrymen are still using antiquated appliances. How far this is from the truth hundreds of other English engineers can testify. The improved methods adopted in American quarries have called out a constant chorus of surprise and admiration from foreign visitors.

THE FIGHT OVER THE SAN FRANCISCO POST-OFFICE.

ONE of the hottest fights the stone trade has known for years has been over the bidding for supplying granite for the new United States Post Office building at San Francisco. This has kept several States aroused for weeks, has set Congressmen and politicians hard at work pulling all wires within reach, has called out reams of newspaper controversy, and has even caused the appointment of a special Government commission. The story of the controversy is an interesting one, but in the absence of an official report it is difficult to get at the exact facts. No two accounts of the matter agree. The papers published in the States where the different contractors live all tell stories that widely vary in the most essential particulars. The main points in the fight are as follows: Several months ago the National Government advertised for bids for the stone work, etc., for the new post office and court house at San Francisco. The specifications called for "granite," and no particular kind was indicated. As the amount of granite required on the contract was 135,000 feet, or 15,000 tons, the bidding naturally aroused great interest. The bids were opened on April 17, at the office of the architect at Washington. W. H. Ellis, of Cincinnati, put in one bid, specifying the use of Peerless granite. This is from the Index quarry, Washington. He also put in a higher bid, specifying the Delano granite, from California. The California Construction Company based its bid on the use of Rocklin, California, granite. The Bentley Construction Company specified the Raymond, California, granite. Finally the John A. Davidson Company, of Chicago, put in a bid, higher than the others, specifying the use of Maine granite. Then began the merry war. The people of California made the not unnatural claim that, inasmuch as the building was in their own leading city, it should be built of stone native to the State. The San Francisco "Evening Post" voiced the sentiment of the people as follows:

"If the new post office were an ornamental structure, designed to gratify the fancy of a notional man or an individual crank, it might not be inappropriate to build it of stone dug in Texas, Maine, South Carolina or any other State; but, as a matter of fact, it is a public building, and the Government ought to desire to construct it in a practical and economical manner. There may be, and probably is, objection to some of the stone quarried in California. Perhaps Rocklin granite is not adapted to such a building as the new post office is designed to be; but there are other quarries in the State from which the very best material may be obtained. Those located in the County of Inyo, for instance, yielded the marble and granite out of which the Mills Building was constructed, and no prettier edifice than that exists anywhere. If the Treasury Department officials who have charge of letting the contract of the new post office authorize from other States the use of material which can be obtained in this State, they will justly merit the criticisms, not only of our

people generally, but of our capitalists, whose money is invested in quarries and who are trying to develop the marble and stone industries of the coast."

But the State of Washington had something to say to this. The Chamber of Commerce of Seattle addressed the following letter to James K. Taylor, the supervising architect at Washington:

"Substitution of California granite at this time would be a distinct condemnation of Washington granite, for purely local reasons. These reasons are not creditable to those urging the change, for they are simply and solely that the building should be a State affair instead of a National, and that more Government money would thereby be spent among Californians in its construction. This is selfish and unpatriotic. Were the building put up by the State itself for its own purposes the course recommended, if pursued, would be more or less praiseworthy. In a National building, paid for and owned by all alike, it would be reprehensible in the extreme. It is not urged, we believe, that the Washington granite is inferior, and in truth it cannot be so urged. The granite here is first class and in every way fit for Government houses at San Francisco, Washington, D. C., or anywhere else. The Federal Building at Portland, erected nearly thirty years ago, was constructed of Washington sandstone. This State is noted above all others for the abundance, excellence and variety of its house-building materials. There are lime, cement, stones, timbers of many kinds, and clays, from which common, pressed, fire and other bricks are made, as also terra cotta. That the Government of the United States should place its condemnation upon any of these materials, with no more reason than in the California case, is not to be contemplated for a moment."

But this was not the final word. Senator Mason, of Illinois, took up the cudgels for the John A. Davidson Company, of Chicago. The claim was set up that California granite contained iron that discolored it and caused it to crumble. As the Davidson Company proposed to use Maine granite, the Senators and Congressmen from that State took a hand in the row, to push the claims of the latter bidder. So, then, at last the fight stretched clear across the continent, from Maine to California. Some of the contestants came to actual blows at Washington.

At this point of the controversy a special Government committee was appointed to examine and report upon the several grades of California granite offered. The committee consisted of Hon. Frank A. Vanderlip, Assistant Secretary of the Treasury; Dr. Caleb Whitehead, an expert chemist, attached to the Mint Bureau, and Mr. J. W. Roberts, of San Francisco, superintendent of the public building. The committee visited the quarries and inspected a number of buildings where the granites had been used. It reported that the Raymond granite was as durable as any to be found. Meanwhile the first bids had been rejected and new ones called for. On these the contract was finally awarded to the Bentley Construction Company at \$802,500, to use the Raymond granite. So San Francisco's post office will be built of California granite, after all.

RANK VANDALISM PROPOSED.

FOREIGN correspondents report that four or five companies, European and American, are interested in a proposed tearing down of the Great Wall of China. The wall happens to be in the best state of repair in districts that are most accessible and populous, and it is believed that the building stone from the wall will be worth fortunes to those who may secure the concession to tear it down. There are supposed to be fully 4000 million cubic feet of masonry in the great structure, which has a total length of about 2000 miles, including its many windings and the double and triple walls that are constructed at some places. There is no doubt about the amount of building material that could be secured from this cyclopean structure. There is more dressed stone in it than ever came out of a single quarry since the world began. But there is also an inconceivable amount of stone in the pyramids of Egypt, in the temples of Karnac, Denderah and Luxor, in the ruins of the Acropolis, at Athens, and in Herculaneum and Pompeii. But who would propose to rend these apart in order to save the quarrying of new stone? There is even less excuse for the vandalism that would turn the Great Wall of China into a quarry for modern building material. Nowhere is labor cheaper than in China, and there are countless millions in the Empire who need all of the work that can be provided.

The Great Wall has never ranked among the seven wonders of the world, although it deserves a place in that famous list as much as several of the structures that have been included. With the exception of the Pyramids, it has lasted longer than any of them endured, and the minds that engineered it and the skill that built it were at least as remarkable as the genius that called into being the Hanging Gardens of Babylon, or the Pharos of Alexandria. The Emperor Che Hwang-te has two claims to remembrance, or to put it better, one claim to eternal fame and one to eternal infamy. He conceived and ordered the Great Wall, and he gathered the whole existing literature of his country, with the exception of the books on medicine, agriculture and divinition, and had them burned. The last job he finished himself, with great thoroughness and dispatch; the first, he could but begin himself and leave to his successors to finish. Finding the Heung-nu Tartars were making dangerous inroads into the empire, he determined with characteristic energy, to build a huge barrier which should protect the northern frontier of the empire through all time. In 214 B. C., the work was begun under his personal supervision, and though every endeavor was made to hasten its completion, he died (209) leaving it unfinished. In the end it was a failure, for it could not keep out the hordes of Genghiz Khan, who swept over it and conquered the country in the thirteenth century. After that time the wall ceased to have any strategic importance, but for fourteen centuries before the great conqueror lived the wall had well served its purpose. It stretched all along the

northern frontier of China and none of the hordes of the north had been able to pass it. Day and night for centuries Chinese guards were mounted on the towers that overtopped the wall, and they always gave timely notice of the approach of an enemy. Garrisons were stationed at every gate and natural passage through the walls and towns sprang up in these encampments, many of which became important market places. Thus the wall really helped China to develop into a strong nation, for during the process the great barrier was of much assistance in keeping outside barbarians from molesting the country.

Time has left its marks upon this hoary monument of China's early civilization. The climate is severe, and the fierce winter blasts from the Mongolian plains alternating with hot winds from the South in the change of the monsoon are enough to crumble the best masonry. A good deal of the earliest wall has undoubtedly disappeared, and from century to century much of the structure was repaired and entirely rebuilt. In the course of this work the lines of the wall for long stretches were wholly changed, and the work of different generations is apparent in the various architectural aspects of the structure. The eastern part of the wall, north of Pekin, is supposed to have been the latest to be repaired and rebuilt, and it is now in a very good state of preservation, while for stretches further west it has disappeared entirely.

To tear down the remnants of the wall now would be almost to equal the vandalism of the man who built it when he destroyed the existing literature of his country.





A stone quarry has been opened just north of Omer, Mich., which is supplying Bay City and other places with a good quality of stone. M. J. Griffin, of Detroit, is the owner and operator.

Jeremiah Dukes, foreman of the city stone quarry at Rockford, Ill., was severely injured by the premature explosion of a can of blasting powder.

Jones & Laughlins, iron manufacturers of Pittsburgh, have purchased the limestone mineral farm owned by Peightet Bros., along Clover Creek, Blair county, Pa. The consideration was \$8,000.

Work in the granite paving block quarries at Sedgwick, Me., is being carried on extensively, and large quantities of the output are being shipped.

The Metropolitan Granite Company, whose offices are in the Washington Loan and Trust Building, Washington, D. C., is equipping its granite quarry at Winston, Va., with a full line of approved appliances.

The Granite City quarry, at Iola, Wis., has resumed operations and is again shipping granite.

Owen Coleman, proprietor of the Slate Run stone quarry, near Williamsport, Pa., is stripping a block that promises to exceed in size anything heretofore quarried in that locality. The block measures 40x20 feet.

William McFarlin has begun work in his stone quarry, located two miles west of Manhattan, Ill.

Mr. Lot Daniels has opened a stone quarry at Rowlands, near Port Jervis, N. Y., and has a large force of men at work.

The Mantorville (Minn.) Stone Com-

pany has stripped and uncovered additional tracts of its quarry.

The big Fellerath quarries, east of Port Clinton, have been sold at trustee's sale. Joseph Fellerath, the former owner and operator, having become a bankrupt. The whole plant and land, comprising a number of acres, were sold at less than \$5,000. This amount will barely pay the few preferred claims.

The East Moline (Ill.) Quarry Company is taking out a large quantity of stone for the foundations of the Union Malleable Iron Company's shops.

The Garretson (S. D.) quarry has so many orders for stone on hand that it has been compelled to largely increase its force of quarrymen.

Active work has been resumed at the Northeastern quarry at Duck Creek, near Green Bay, Wis. New men are taking their places as soon as the company can find room for them. The quarry has a number of orders on hand, including several for bridges.

There has been a large revival of business with the stone men in the Black Hills region of South Dakota. In large part this is owing to contemplated improvements by the railroads. Fred T. Evans and John L. Burke, of Hot Springs, have orders sufficient to keep their quarries busy all summer and fall. The quarries have been worked just enough to have reached the best of the sandstone and the quality of that which is being taken out now is of the finest.

The Johnson Stone Company, whose quarries are located near Auburn, Neb..

STONE.

have a large force of men at work getting out stone to fill contracts. The company was organized in January, and since then it has shipped more than seven hundred carloads of stone to nearly all of the principal towns and cities of Nebraska, and to some points in Kansas and Iowa.

A syndicate of Birmingham and Sheffield (Ala.) parties has purchased the Keller lands west of and contiguous to Sheffield, on which there are large quantities of limestone rock, and will develop the quarries thereon. The government will use a large amount in the work on the Colbert Shoals canal at Riverton.

John Baughman, Sr., has sold his interest in the Mount Pleasant (O.) stone quarry to his son, John, who will continue the business.

There was a short strike in the Malone quarry, at Amherst, O., early this month, but the owners made concessions and the men resumed work.

The quarrymen at Lithopolis, O., are uncovering some very large stones.

Frank Bradbury has increased his force of men at the West Franklin (Me.) quarries.

John Myers set off a large blast in his stone quarry at Leaf River, Ill., and it opened up a regular cavern. The solid rock was split from the top to the bottom of the quarry, and through one of the openings a man can walk fully thirty feet and stand erect.

Devil's Island, near Stonington, Me., has been purchased by Boston men, and quarries will be opened there.

The new quarry of the Lemont (Ill.) Limestone Company is turning out beyond expectation. All of the quarries at Lemont are in full operation.

The Kankakee quarries have contracted to deliver and spread crushed stone on the roads at Gibson, Ill., at \$1.25 per yard.

The Ashton (Ill.) stone business is booming, as a result of the general building activity. The quarries of James Quick and John Jones are both receiving orders faster than they can fill them. The stone is a species of sandstone, and is admirably adapted for building purposes. The leading market at present is Rochelle, Creston, Malta and De Kalb. The business has developed to such an extent that the Northwestern road will probably run a switch to the quarries.

From month to month STONE has made record of the activity of the Missouri quarrymen. In a recent issue the Carthage Evening Press had the following account of the work being done in that town, two new quarries having been opened there this season:

There are now four quarries on the Missouri Pacific switch north of town, one on the Frisco one-fourth of a mile west of the depot, and one on Center creek west of town, which makes a total of six quarries to be credited to this locality—all getting out magnificent stone and running up to full capacity, with orders waiting. There is much promise for the future of this industry here, as their constantly growing business shows.

The new plant of the Carthage Marble & White Lime Company, which has just been erected at their new quarry a mile west of their well known pioneer quarry north of town, is just starting its saws to-day. They have one of the best built plants in the locality, begun last January. S. Lloyd is foreman of both the old and new quarries.

Another new quarry in process of development is that of the Carthage Quarry Company, of which E. O'Keefe is president; F. A. Steadley, vice-president; F. W. Steadley, secretary and treasurer, and Martin McNerney, general manager. The other stockholders of the company are P. J. McNerney and W. H. Phelps.

The quarry boss is Bob O'Brien. The work on this quarry plant was started about March 1, and has been rapidly pushed towards completion.

General Manager Martin McNerney, of this company, says he was the first man to discover the limestone ledges of this vicinity. This was in 1881 when, as a contractor, he built the Missouri Pacific bridges in this locality. He got the stone from the ledge where the Carthage Marble & White Lime Company now operate. I. F. Garner then followed Mr. McNerney's discovery by starting a regular quarry, and the Carthage Marble & White Lime Company are his successors.

In addition to the above, it is well to mention that the Carthage Stone Company, the one farthest out on the Missouri Pacific switch, the Viernow quarry on the Frisco and the Center Creek quarry, which are all old companies, are all running steadily and crowded with orders.

Stone Trade Notes

The Virginia Soapstone Company, which is located sixteen miles east of Charlottesville, Va., near the town of Alberene, is building an electric railway from Schuyler to Rockfish, a distance of five miles. Alberene now has a population of nearly 3,000. The soapstone company employs over 600 operatives, and this electric railway will connect with the Southern Railway.

The Great Western railway has given a rate of 4 cents a hundred pounds on shipments of stone from Mankato to Minneapolis and St. Paul. The Mankato stone men complained that they were discriminated against unjustly, as the rate was only 4 cents on Kettle River stone, 122 miles from the Twin Cities.

W. C. Legg is running his quarries at Chesaning, Mich., to their full capacity. Mr. Legg has shipped over a hundred car-loads of crushed stone, on a contract that calls for about 150 carloads for the Bay county roads. He also has a contract for a large amount of stone for use in Tuscola county and in the building of the Caro sugar factory.

Three large building contracts in Chicago are tied up as the beginning of a crusade against stone used in buildings there which has not been cut in the city.

The O. J. Kellar Lime Company, of Charleston, W. Va., has been incorporated for the purpose of manufacturing lime and dealing in building stone. The subscribed capital is \$1,000; authorized, \$250,000. The incorporators are: Charles E. Kellar, of Jefferson county, W. Va.; William O. Kellar, and John F. Kellar, of Buckeystown, Md., and Lilly M. Kellar, Mattie J. Ford, O. J. Kellar and Bertha L. Kellar, of Frederick City, Md.

The stone industry at St. Paul, Ind., is gradually improving and a number of cutters from other parts of the country are finding employment there.

The strike at the Rockport (Mass.) granite quarries, which lasted fifteen weeks and affected 2,000 men, has ended

in favor of the strikers. The result was made known in a letter from the Boston counsel of the Rockport Granite Company to Col. William A. Pew, Jr., counsel for the strikers, announcing the fact that the company had acceded to every demand made by the workmen. These include a nine hour day for five days in the week with eight hours on Saturday, and time and one-half to be paid for all over time. The company also agrees not to discriminate against any man who took part in the strike and also stated that they will endeavor to continue in the future as much winter work as possible.

A new stone firm at Dayton, O., is H. E. Talbott & Co., who have opened shops, equipped with modern machinery, for all kinds of stone cutting and dressing, at the foot of Eaker street. One of the specialties of the company is heavy masonry. Mr. Talbott has had fifteen years' experience as a civil engineer for various railroad companies.

Several of the stone quarries of the Fox river valley, Wis., are busy estimating the cost of the stone for a new lock which the Government is talking of building next winter at Appleton.

Merritt Black, of South Kaukauna, Wis., has secured the contract for all the cut stone for the new mill of the Wolf River Paper and Pulp Company at Shawano.

The Saginaw (Mich.) Land, Brown Stone and Copper Mining Company has elected the following directors: W. A. Atwood, Flint; P. A. O'Donnell, Saginaw; Charles E. Edwards, Saginaw; E. H. Scott, La Porte, Ind., and J. F. Marskey, Saginaw. Officers were also elected: President, P. A. O'Donnell; vice-president, C. E. Edwards; secretary, J. F. Marskey; treasurer, E. H. Scott. The company will hold a meeting July 25 to decide as to the sale of certain lands that it owns.

The Co-operative Stone Company, of Batavia, Ill., has secured the contract for the stone work of the new M. E. church at Elburn.

The Lena (Ill.) city trustees have purchased an \$800 steam stone crusher and installed it at the city quarry.

The Montreal authorities have given the contract for furnishing curbstones to a contractor who cut the stones in the city, at a higher figure than was offered by another contractor who had the stone cut elsewhere. The lowest bidder protested, but the officials ratified the contract.

There is a prospect that the Millington (Ill.) sand mine will resume operations after a shut down of over three years.

Messrs. McManus & Tucker have established a stone-crushing plant, with a capacity of five carloads a day, at Ballinger, near Keokuk, Ia. The firm has a contract with the C. B. & Q. railroad for all the rock it can crush.

The city of Winona, Minn., has started a crusade in favor of the use of Winona stone for building purposes, with the result that orders have been placed for the material from points as far distant as Canada. The yards of Steinbauer, Biesanz and Dooney all have large forces of men at work.

Edward Bronson, of Dunkirk, has accepted a position as foreman of the Findlay (O.) Crushed Stone Company.

The Crystal Carbonate Lime Company, Messrs. Pratt and Cash, of Louisiana, Mo., have been awarded a contract by the Government for 36,000 yards of rip rap stone.

A fine quality of lithographic stone has been discovered near Sparta, Tenn. It takes a fine polish and has no grit in it.

The death list of the month includes the name of James Nicholl, who died at North Amherst, O., on July 7. Mr. Nicholl was formerly president of the Cleveland Stone Company. James Nicholl was born in Lochee, Scotland, on December 12, 1833. As soon as he was old enough to work he learned the stone cutting trade, and when a young man emigrated to Canada and settled at Hamilton, where he was engaged as a foreman of stone cutters. He moved to Brownhelm, O., in 1860, and for many years was superintendent of the Brownhelm quarries. In 1880 he engaged in business on his own account, and so continued until 1886, when the Cleveland Stone Company was organized. He sold his quarries to that company and soon after became its general superintendent, which position he held until January, 1898,

when he was elected its president. In May, of the same year, he resigned on account of ill health and retired from active business.

The Broken Sword Stone Company, of Bucyrus, O., has been incorporated. Capital stock, \$10,000.

Lesser & Feinburg, proprietors of a stone yard on Archer avenue, Chicago, have confessed judgment for \$25,200.

The Washington Monument's Lighting Rods.

The Washington monument, the loftiest stone structure in the world, has, according to the description given by Mr. N. M. Hopkins, in the "Scientific American" supplement, an ideal installation of correct lightning conductors. The apex of the monument is an aluminum pyramid, from which eight half-inch copper rods extend down to the base of the stone pyramid forming the top of the structure. At that point they bend inward through the masonry and pass down the interior of the shaft. The eight conductors are all connected on the outside of the pyramid by a heavy rod, and they are all gold plated. Two hundred platinum tipped points, connected with the conductors, connect directly with the tops of four iron columns which support the stairway and elevator. At the base of the monument the iron columns are connected by copper conductors with the bottom of a well twenty feet below the foundation of the shaft, the well containing several feet of water and fifteen feet of sand. Severe electrical storms do not affect the monument.

Rebuilding the Lincoln Monument.

The contract for tearing down and rebuilding the Lincoln monument at Springfield, for which work the Illinois Legislature appropriated \$100,000, has been awarded to Col. J. S. Culver, representing the Culver Stone Company, of Springfield. The Culver Company entered two bids, one with granite figures, by Larkin W. Meade, the sculptor, who designed the bronze statues now on the monument, to cost \$137,000, and the other for \$97,000, without the figures. The figures will probably be dispensed with.

The plans that were drawn do not make any change in the appearance of the mon-

ument, but it will be necessary to take down all the shaft and replace it. The plans also provide for an addition of fifteen feet in the height of the shaft. The architects found on examination that much of the granite was insecure and that it would be necessary to take down each block and rebuild it. The architects propose to take off about half a foot from the base of the monument and this will be used in building the proposed addition of fifteen feet. This can be done without any additional cost for granite.

The heaviest cost in improving the monument will be in building a firm foundation. It will be necessary to build a concrete foundation to extend at least thirty feet below the surface. The present foundation is crumbling on the sides and the architects find that the only way to remedy this is to build a firm concrete foundation which will support the superstructure and shaft without strain. Some other changes are to be made in the monument to make it more substantial, but the general appearance will not be altered.

A New Fireproof Building Material.

A report has been received at the London foreign office from Her Majesty's Consul-General at Zurich respecting a new fire-proof material manufactured in that town. The consul-general states that this is a new artificial stone material which has lately been invented by Mr. Gehre, a Swiss civil engineer, called papyristite, on account of its component parts, principal among which is purified paper pulp obtained from waste paper. Papyristite is said to be an improvement on papyrolith, which was also invented by Mr. Gehre. It can be adapted for various purposes, but is specially intended to serve as a solid, impermeable and jointless roof or floor, which when laid down, will present a smooth surface, as if made in one continuous layer. It is claimed to be absolutely fire-proof and a non-conductor of cold or sound, and, although as hard as stone, it has a soft linoleum-like feeling to the foot, and is noiseless. As there are no grooves or joints in the material, no dust, vermin, or fungi can accumulate, and its weight is much less than that of stone or cement. Two hundred and twenty pounds weight of this preparation in a powdered form, when mixed for use and spread to a thickness of

0.3940 inch, will cover a surface of $9\frac{1}{2}$ square feet.

No machinery is necessary to prepare the compound, although, to save labor when large quantities are to be used, an ordinary press can be utilized to advantage. It can be moulded or spread in any desired form or shape. The mixing is done on the spot where it is wanted, and it is transported, like cement, in barrels or sacks. The drying or hardening process is effected in twenty-four hours after spreading, and the papyristite can then, if desired, be polished to a high gloss. It can be cut, sawn, and bored, can be given any desired tint, and can be made to look like mosaic or marble. It is also said to be valuable for roofing purposes, and the inventor has constructed a light iron frame, on which the material can be laid, in the form partly of plates and partly of mortar, which, when united, produce a smooth, continuous surface. It is adapted to cold as well as tropical regions, and its stone-like qualities prevent it from being destroyed by mice or other vermin. The material will not contract or warp after having been laid down; it is elastic, light and inexpensive in production. For schoolrooms, public halls, corridors, bathrooms (both floors and walls), terraces, barns, poultry yards, etc., it will prove a clean and healthy material, and as it does not absorb moisture, dirt, or any other unhealthy substances, it will be an excellent building material.

The Mineral Resources of Chili.

Chili has, at the end of last year, made a beginning with publishing statistics on the mineral wealth of the country, which has always been considered great. This first report has been compiled by the well known National Society for Mining in Chili, with the assistance of Government and municipal authorities, and the Government has given its sanction to the issuing of this report. Whether the wealth is really as great as has been assured can not well be seen, for there are peculiar omissions on the lists, no mention being made of sodium nitrate, for instance, of which everybody will at once think, and the concerns are simply enumerated without much clue as to their importance. Moreover, the nature of the ores is frequently not stated. These defects must attract atten-

tion, and we may hope that the second report will be an advance on this first attempt. As regards gold, it would appear that there are a good many spots where people go in for a little washing which is free to everybody, but no properly exploited mines. The gold exports of the country are, indeed, not important. They amounted in 1897 to 1,132 kilogrammes, which is about a fifth of the gold exports of the forty-five years which expired in 1888. These figures refer to metallic gold; sixty-four tons of ores were shipped in 1897. The silver mines have been neglected since the country adopted a gold standard. Copper seems to be the most promising metal. There are undoubtedly rich layers of excellent iron ores, but they have not been exploited as yet. The state is ipso proprietor of most minerals—except coal, among other things, which belongs to the owner of the land—but it is ready to part with its rights, and everybody who may own real estate can also acquire mining rights. A man is considered discoverer of a new mine if he strikes ore in a spot within five kilometers (three miles) of which no ore was previously known. He enjoys certain privileges, but can not have more than three claims registered in his name in one department of the country, nor can anybody else, though he may hold shares. The report explains these regulations, which will interest foreign capitalists and mining engineers.

Marble and Granite Working in Milwaukee.

The Milwaukee Evening Journal says: Marble and granite working in its highest mechanical excellence is one of the industries that has reached a high place among the industries of the Cream City. There are seventeen marble and granite works in the city, several of them, one in particular, being very extensive establishments. These establishments work in all of the best marbles, the Italian, the Vermont, the Tennessee and other well known stones, and in the best of the world's granite, Wisconsin, Connecticut and Aberdeen being used the most. The work done is all manner of architectural and cemetery work and many of the finest buildings of Milwaukee and the other cities of the Northwest are finished in marbles of Milwaukee working. Throughout the West granite is a favorite

stone for use as lower course material in the construction of large buildings and some of the heavier structures carry the granite all through. The interiors of most of the large buildings are finished in marbles of various kinds handsomely polished and carved, and Milwaukee's establishments have done a large amount of the work. One of the large marble companies has recently been obliged to find a new site for its extensive and growing business and has located on a large tract of land with ample rail and water facilities on the outskirts of the city. The value of the product of Milwaukee's seventeen establishments of this nature during 1898 amounted to \$365,300 and \$103,500 was paid to the 230 employees. The capital invested in this work amounts to \$224,000. In common with all of Milwaukee's industries this branch of manufacturing is rapidly increasing and the shops are all crowded to their utmost. Many of them are looking for more room and even those that have made recent extensions are finding that their works are filled to overflowing. The output of these works this year will far exceed that of 1899 and will not fall far short of \$500,000.

Clustered Columns.

The clustered column is one of the most prominent features of a Gothic vaulted room, and is therefore always set forth as a leading characteristic of the style, says the "Illustrated Carpenter and Builder." But the clustering of a pier is not merely a kind of enriched fluting, for every shaft and moulding which compose it bears a definite relation to the parts which lie above it, every one of which receives, in the decorative sense, an independent support from some member of the cluster. And notwithstanding the apparent variety of these groups, a remarkable degree of system may be detected by the comparison of them. If it were merely for the illustration of the subject it would be worth while to attempt to recover the laws and rules by which this system was governed; but when we discover in addition to its uniformity in one age and country that it was practiced in different manners in different ages and countries, that its various parts may be traced from different districts, some from the earliest ages, others of later invention, the whole being gradually brought together

with increasing complication, a new interest is excited, and the investigation becomes absolutely necessary to the history of architecture. We have said "recover the laws," because the possibility of detecting them proves that they were recognized by the artists, and there is no doubt that the parts of Gothic decoration were as well defined in their own age as the division of a Roman entablature into architrave, frieze and cornice, which, had Vitruvius been lost, we must have picked out for ourselves from a comparison of examples. Clusters are largely employed for the support of arches, as in rich doorways or the pier arches of churches. An archway of this kind may either be considered as a single arch decorated with a quantity of mouldings disposed in succession on its slanting surface and supported by a group of shafts and moulded pier edges, or it may be resolved into a number of concentric archways successively placed within and behind each other. When these arches are considered as a whole, the variety of them appears so great and the decoration so various that no systematic description can be applied to them, and as many drawings therefore as there are examples are required to convey an accurate idea of them; but by dividing them into separate arches it will be found that the treatment of these is reducible to a few simple principles.

Marble Men to Unite.

The Knoxville (Tenn.) Sentinel, in a recent issue printed the following: The movement that has been on foot for several months to form a compact organization, embracing all the dealers in Tennessee marble, is nearing completion. The intention of the association, or organization, is not to raise the prices of marble as might be supposed. No such idea is entertained. The intent is this: East Tennessee abounds with marble that has made Tennessee famous as a marble country. It is in East Tennessee that the fine marble of the State is found. A dozen or more concerns put the marble on the markets of the country, and it is believed by the marble men that if an organization was formed it would be of great benefit and protection to its members. If such was done, a united effort will be the result in placing the marble on the markets of the country. Several meet-

ings have been held during the past few months with a view of taking steps toward the accomplishment of this organization and success is about to reward the efforts of those at work on the scheme.

The Old Muenster Cathedral.

Among the many old structures of the City of Muenster which have been preserved to this day perhaps none is of such importance, both architecturally and historically, as the cathedral. On a spot south of the "old cathedral" (alte Domkirche), built by Bishop Ludger (802-809), on the northern slope of the Horsteberg, the ninth bishop, Duodo (969-993), erected a larger "new cathedral" (neuer Dom), to which various structures were added by the successors of Duodo. The three bishops, Frederich II. (1174-1203), Ludwig I. (1169-1173), and Herrmann II. (1174-1203), erected the towers, and the intermediate so-called "old choir." Under Bishop Theodoric II., of Isenburg, and his successors, these structures were completed, after forty years of labor. Finally, in 1265, Bishop Gerhard von der Mark consecrated the entire building. Centuries have not passed over the cathedral without changing much and adding to the structure. The main building, however, still retains many of its Mediaeval features. The main structure is a vaulted triple-naved basilica, having an east and a west transept, a western choir between the two square towers, and an eastern pentagonal tower adjacent to the choir. The towers and the intermediate "old choir," so called to distinguish it from the other choir, are built of quarry stone and free stone; the remaining parts of the building are composed of ashlar. With the exception of the brick vaults of the transepts, the vaults are all built of massive blocks of quarry stone. In the roofs sheet copper has been used. The exterior of the Muenster cathedral does not present the picturesque magnificence of most Rhenish churches of this period; but, on the other hand, it has an aspect of quiet dignity not found in most German mediaeval basilicas. The entire structure is of interest, not only because it affords examples of the different architectural styles which were prevalent during the period of its development, and which are embodied in the various extensions and additions, but because of its vast, splendid interior, which produces an impression not made by any other mediaeval structure in Germany.

Marble and Granite

The Maine & New Hampshire Granite Company's works have started up again. They have a contract for a library at Pawtucket, R. I., and report a large amount of work ahead.

J. B. Mullen, of Oldtown, Me., has been inspecting the granite quarries at Island Falls, with a view to using their output in the Millinocket mills.

J. W. Gracy has opened a new marble yard in Ripley, Tenn. The business will be known as the Ripley Marble Company.

A big contract recently assumed by the Maine & New Hampshire Granite Company is the furnishing of the granite for the Morse-Oliver building in Bangor. It is the largest contract in granite that has been made in Maine for over thirty years. The pink stone from the Redstone quarries will be used in the Bangor building. The stone will be dressed at the quarries.

The Ashley Falls Marble Company has been incorporated at Elizabeth, N. J., with a capital of \$200,000 to do business in Massachusetts and Connecticut, as well as in New Jersey. It will quarry and dress marble. The incorporators are William D. Thanzerlin and Virgil L. Brooks, of Dayton, O., and William D. Murray, of Plainfield, N. J.

Among contemplated improvements at Chicago is the paving of North Clark street from Kinzie street to 160 feet south of North Water street with granite. Clinton street is to be paved with granite from Lake street to Van Buren street, while Dearborn avenue is to be paved with the same material from Kinzie street to 163 feet south of Kinzie street.

The granite cutters of Georgia have given employers a three-months' notice of a 20 per cent. increase in wages to be asked—making the uniform wage of \$2.75 per day all over the State.

The Salt Lake Onyx Company has shipped a carload of its product to Chicago, where it will be dressed and a portion of it used in an exhibit at the Paris Exposition. The onyx comes from a

quarry near Pelican Point on the west side of Utah lake. It is of a beautiful orange color and of a very fine texture, and is in slabs of an immense size.

John M. Ross, the marble man who recently sold his interests in marble property located southeast of Knoxville, Tenn., to Messrs. Frank Mead and others, has just purchased a seventy acre tract of marble land from James K. Griffin, on which fine marble is supposed to be located. Mr. Ross will not open a quarry on the land at present, but may at some future time. It is near the old quarry and the same fine quality of marble on it is thought to be here as exists in inexhaustible quantities in the old quarries.

Cross Bros., of Northfield, Vt., are taking on many new cutters. During the month of May the firm received 600 tons of Barre granite.

The Columbian Marble Company has already shipped a number of carloads of marble from their newly opened quarry at Monkton, Vt. The ledge is about a mile in length and half a mile in width, therefore the quantity is large. This is the marble discovered some ten or twelve years ago by the late Julius Doten, but has remained undeveloped until this spring, when the Columbian Marble Company was interested and a force of men put at work a few weeks ago. The marble is of very fine quality, of the dolomite variety. There are the following colors: White, deep blue, mottled blue, delicate dove, light and dark agate, cream, red and white, very dark red, gray, red and white, with serpentine colors. The marble taken out so far has more than met expectations.

Work is being rapidly pushed on a new marble mill at Middlebury, Vt., and the plant will soon be in operation.

The Vermont Marble Company will furnish the exterior marble for the new library building at Middlebury college.

The Evans marble mill, at Knoxville, Tenn., is turning out a large order for the new public library in Newark, N. J., which

will be one of the finest buildings of the kind in the country. Another order which speaks well for East Tennessee marble has found its way from London, England, to the Evans company's mill, for interior finishings. It consists of marble wainscoting, baseboards, columns, etc. The designs are already on hand for the greater portion of the work and others will be received in a short time. The first shipment will be made at an early date. The marble will go in a big London restaurant, "The Criterion."

The New England Granite Company, of Concord, has largely increased its force of cutters.

James Duncan, of Baltimore, has been re-elected secretary of the National Granite Cutters' Union. Mr. Duncan will remove to Boston, where the headquarters of the union are to be located. The move will be made to enable union officials to be in touch with New England when the union inaugurates its demand for an eight-hour work day at minimum pay of \$3 per diem. Some antagonism is apprehended from New England employers.

Messrs. Henneberry & Halligan, of Concord, N. H., have a number of large contracts on hand. Their quarry is getting into good condition and is producing a fine grade of monumental granite.

The New England Granite Works, of Concord, N. H., have secured the contract for a large monument of Concord granite. The monument will be surmounted by a group of figures, to be cut by Fred Barnicoat, of Quincy, from models by the celebrated sculptor, Conrade, of Hartford, Conn.

C. I. Schooner, C. J. Bush, G. E. Bock and others have incorporated the United States Marble Company, of Knoxville, Tenn., with a capital stock of \$25,000.

The Peoria (Ill.) "Journal" says: "There is a great load, a load weighing not less than the 200 tons of granite which caused it, has been lifted from the necks of those in charge of the Peoria soldiers' monument. This is because it is at last announced that the granite blocks, which are to form what is known as the cap and die of the monument, have been safely carried over the stormy waters which interpose themselves between Deer Island and the mainland, or coast of Maine. The granite blocks are in Boston. They are

unhewn yet, but can now be chiseled out and adjusted to suit in short order. They form the second set of supplies, for the first stones constituted a deck load that sent a schooner to the bottom of the briny ocean last spring, and since then the owners of similar craft have been afraid to take them aboard."

Mr. B. W. Seymour, of the Kennesaw Marble Company, died at Marietta, Ga., on June 30.

The Van Amringe Granite Company, of Portland, Me., has been incorporated with \$20,000 capital stock. The directors are William B. Van Amringe and Frank M. Frost, both of Boston, Mass., and Harry L. Cram, of Portland. The clerk is Frederick Hale, of Portland; the president is William B. Van Amringe, and the treasurer is Harry L. Cram.

A. G. McAlpine & Co., of Concord, N. H., have removed from their old stand to the shed formerly occupied by M. G. Gannon & Co., their increasing business requiring more room.

Fire-Resisting Mortar.

The discovery is reported that serpentine rock, when powdered and mixed with good lime, forms a mortar that will successfully withstand heat to 1,100° F., and will not crack if subjected when at this heat to contact with cold water. The new material, besides being in the highest degree fire-resisting, is also declared to be so elastic as not to crack when the building settles and permits of nails being driven into it. It is said to be one-third lighter than ordinary mortar, easy to handle, and capable of receiving decoration.

The Temperature of Deep Mines.

According to Mr. J. Sterling in the "Transactions" of the Australasian Institute of Mining Engineers, observations taken in Lansell's 180 Mine at Bendigo, show increases of temperature in depth as below: At 454 feet, 1° F. for each 110 feet; at 1,294 feet, 1° for each 182 feet; at 1,750 feet, 1° for each 173 feet; at 2,295 feet, 1° for each 152 feet; at 2,701 feet, 1° for each 137 feet; at 3,110 feet, 1° for each 110 feet; at 3,250 feet, 1° for each 111 feet. The mean result of these ratios shows that the ratio of 1° F. for every 137 feet in depth is the record of the Silurian rocks of Bendigo.

Monumental News

Mr. E. S. Shattuck, formerly connected with the Maine Red Granite Company, has opened a general monumental granite business at Machias, Me. Mr. Shattuck will use local stone for bases and such other work as it is fitted for.

A movement is on foot in Ohio to erect a monument over the grave of Gen W. H. Gibson in Green Lawn cemetery, near Tiffin.

Money is being raised in Georgia for a monument to the late Henry B. Plant.

The alumni of the Virginia Military Institute are raising money for a monument to the Virginia cadets who fell at New Market. The monument will face the Cadet Cemetery, where the young heroes were buried. It will take the form of a bronze casting of the statue by Sir Moses Ezekiel, "Virginia Mourning Her Dead." Ezekiel was himself one of the gallant band.

A Bland monument association has been formed at Lebanon, Mo., J. W. Farris president. More than \$1,000 has already been subscribed for a memorial to the late congressman.

The Vermilion County (Ill.) Veterans will erect a monument to their dead comrades at Springfield, to be finished not later than July 4, 1900. The sum of \$3,000 is already in hand. E. C. Abdill, Danville, may be addressed.

The State of Connecticut has appropriated \$1,000 for a monument to mark the spot where Gen. J. K. F. Mansfield, commander of the Twelfth Corps at the Battle of Antietam, was mortally wounded.

Lake county, Ill., has appropriated \$600 to complete the erection of its soldiers' monument.

Utah is raising money for a monument to her soldier dead. The design will probably be the statue of a volunteer mounted on a pedestal and with a cannon beside the figure in special recognition of the Utah batteries.

In 1835 the West Virginia Legislature appropriated \$3,500 with which to build a monument to commemorate the battle of

Point Pleasant and the money has been kept on interest all these years with the result that the trustees now have a fund of \$8,788.33 and will proceed to construct an imposing monument. Point Pleasant is where old Chief Cornstalk fought his battles, and where a monument now stands erected to his memory, the second monument in the world erected to an Indian.

Minnesota Sons of Veterans have started a movement which will probably be taken up by the order all over the country, for the erection of a monument to Major A. P. Davis, of Pittsburg, the founder of the society.

The Order of Foresters has erected at Toronto a life-sized bronze statue of Dr. Oronhyatekha, Supreme Chief Ranger. The statue was modeled in clay by the young Canadian sculptor, Walter S. Allward, and was cast by Messrs. Bureau Bros., of Philadelphia.

In the year 901 King Alfred the Great of England died and was buried in the town of Winchester. Now it is proposed to celebrate the thousandth anniversary of his death by erecting a statue to his memory and building a memorial hall, which shall be used as a museum of English history. The statue has been designed by Hamo Thornycroft. To complete the memorial the sum of \$150,000 is wanted. A national committee has been appointed and an effort is being made to raise the money by small subscriptions from all classes of people.

The Oregonian, of Portland, has headed a subscription for a monument to the volunteers of the State who died in the Philippines.

As finally accepted, the soldiers' and sailors' monument in New York will be erected on Mount Tom, in Riverside Park, from a design by Charles W. and Arthur A. Stoughton and Peter E. Duboy. It will be of white marble, eighty feet in height, and eighty feet above the river. It will cost \$250,000.

Daniel C. French, the sculptor, is at

work on a statue of Gov. John S. Pillsbury, of Minnesota. It will be completed next June and will be unveiled in connection with the commencement ceremonies at the State University.

Messrs. Crosby & Devlin have newly equipped their monument works on Dorr street, Toledo, O., with modern machinery.

A statue of Gen. John K. Reynolds was unveiled at the Gettysburg National Park on July 1, the thirty-sixth anniversary of his death. It is the third statue in the park provided by the State of Pennsylvania, Meade and Hancock having been previously honored.

Australian advices received at Vancouver, B. C., say that the officers of the British and American warships, who have been fraternizing during the recent trouble in Samoa, have decided to erect a joint monument to the memory of the English-speaking slain in the various engagements. It is intended to erect a granite monument with the names of the British engraved on one panel and the Americans on the other, surmounting the roll of the killed with the British and American flags intertwined.

The members of the Shiloh monument commission, appointed by the governor to use the appropriation of \$65,000 made by the late session of the Illinois Legislature for the erection of regimental and state monuments on the battlefield of the battle of Shiloh, has appointed a committee, composed of William McEwen, of Litchfield, chairman; George Mason and Augustave Busse, of Chicago, to select the best plans offered, and report to the committee at its next meeting.

A large bronze statue of Garibaldi is to be erected in some Chicago park. A committee of the different Italian societies has been chosen to select an artist and sculptor to make the monument.

The National Admiral Dewey Monument Committee was recently organized for the purpose of securing funds for a statue of Admiral Dewey, to commemorate his great victory at Manila, to be procured solely by contribution from Vermonters now resident outside of their native State, and to be presented by them to the State of Vermont.

Alabama is raising funds for a monument to her soldiers who were killed in the battle of Chickamauga.

Maryland's monument on the Antietam battlefield will be dedicated on September 18, the thirty-seventh anniversary of the battle.

Iowa is likely to erect several monuments in Chickamauga Park. So far, the State is not represented by any memorial in the park.

Great Falls, Mont., is raising a fund for a monument to the sons of the State killed in the Philippines.

There is talk of the erection of a statue of Gen. Newberry in front of the library that bears his name in Chicago.

A fund has been started in the State of Washington for a monument for Ensign John R. Monaghan, U. S. N., who was killed in Samoa. Ensign Monaghan was a native of Spokane.

The Soldiers' and Sailors' Monument Association of Oswego county, N. Y., organized two years ago, is making renewed efforts to raise a fund. The sum of \$1,500 has been secured.

David Christie Murray, the English novelist, proposes the erection by popular subscription of a monument to Washington in London.

Mr. Louis Goesel, formerly with the Chicago Monument Company, has opened monumental works of his own at Tinley Park, Blue Island, Ill.

Kentucky Daughters of the Revolution are raising funds for a monument on the site of the old Boonsboro fort, in memory of Daniel Boone and other pioneers.

The Grand Army posts all over Montgomery county, Kan., propose to erect a monument on the court house grounds, Independence, for the members of Company G, Twentieth Kansas Regiment, who were killed in the Philippines.

Charles F. W. Gazely and George Moffitt opened monumental works at 507 South Pearl street, Albany, N. Y. The former is a nephew of James Gazely, who for nearly half a century conducted monumental works at the Rural cemetery, in that city, and was in his uncle's employ for twenty-five years. Mr. Moffitt is the son of a former member of the firm of McMurray & Moffitt, who were engaged in the same business for many years in Albany.

The Lovejoy monument has just been completed and dedicated in Grandview cemetery, Alton, Ill. This was erected to the memory of Elijah P. Lovejoy, the

great abolitionist, who was murdered in that city in 1837 by an angry mob, which also destroyed his printing establishment and threw his press into the Mississippi river. For years the grave of Lovejoy, in Grandview cemetery, was unmarked save by a simple tablet bearing the name of the martyr and the Latin inscription: "Hic jacet Lovejoy; jam parce sepultra." As a result of the efforts of the Lovejoy Monument Association an appropriation of \$25,000 was obtained from the Illinois State Legislature, Gov. John P. Altgeld signing the bill. An imposing monument was then erected in the most commanding view in the cemetery by the Culver Stone Company of Springfield after a design by Sculptor Robert P. Bringhurst, of St. Louis.

John Baumgartner sold out the Electric Granite Works at Akron, O., to Darwin E. Hand, who has been in his employ for some time. Mr. Baumgartner will devote himself to the sandstone department of his business.

The Alpena (Mich.) Monumental Works intends to extend its business to a large number of the towns on the shores of the lake.

A movement has been started at Columbus, O., to erect a monument at the United States barracks in that city in memory of those who died in the late war. Among those from the barracks who lost their lives were Gen. Poland, Gen. Haskell, Capt. Dickinson and Lieut. Michie.

A movement has been started in Philadelphia looking to the erection in Fairmount Park of a \$10,000 monument to Richard Allen, founder of the African Methodist Episcopal Church.

New Britain, Conn., has appropriated \$2,000 for a granite coping and steps for the soldiers' monument.

J. H. Ellicott, G. Trentanove and P. Giordani, all of Washington, submitted designs for the Vance monument at Raleigh, N. C.

The statuary ordered for the new Appellate Court building in New York includes ten portrait statues by Messrs. Hartley, Bissell, Bush-Brown, Donahue, Potter, Adams, Martiny, Cooper, Luckman and Lopez.

A Confederate monument will be erected at Union, the county seat of Monroe county, W. Va.

Aberdeen, long regarded as the strong-

hold of strait-laced Scotch Presbyterianism, has decided to erect a statue to Lord Byron, who attended the grammar school there.

Is a Monument a Benefit to An Estate?

A suit of interest to all monument dealers was recently brought before Judge George W. Wheeler in the Superior Court at Hartford, Conn. The suit of the New England Granite Works against Mary T. Johnson came up on a demurrer filed to the reply by Lucas & Thayer, of Norwich, attorneys for Andrew T. Johnson, conservator of Mary T. Johnson, who is his wife. The action is to recover balance due on a \$15,000 monument sold to Mrs. Johnson by the plaintiff. The demurrer set up that a \$15,000 monument is not an article for which a married woman may contract on her own credit, for the benefit of her estate. Charles F. Thayer, who appeared for the demurrer, claimed that if it was true that a woman had the right to contract for a \$15,000 monument and make the same chargeable to her estate, in which her husband and family had an interest, she would have the same right to buy a white elephant or a rhinoceros to place in her door yard. He claimed that the law contemplated that a woman's estate could only be helden for contracts made for the benefit of it and he claimed that the monument was not for the benefit of the estate. R. K. Waller appeared in opposition to the demurrer. Judge Wheeler reserved his decision.

A Tombstone As An Investment.

A special to the St. Louis "Post-District" from Williamstown, Ky., says: As a money-making scheme a monument in a graveyard would ordinarily be considered a queer investment, yet in the Williamstown cemetery there is such a monument that has answered its purpose well.

Twelve years ago a marble works com-rate of 10 per cent. upon the cost price to one of the rich men of Grant county, to erect a monument in his private lot, to be paid for at once, but to pay interest at the pany made a proposition to W. G. Cram, himself as long as he should live. It was to cost \$1,500.

The company's terms were accepted and the monument was built, a space being left

vacant whereon to chronicle the birth and death of Mr. Cram, together with his good deeds. Mr. Cram is yet alive and bids fair to live many years more, though he has passed the age of threescore and ten, and the monument has already paid him \$300 more than the original cost of building.

Last Thursday during a windstorm the shaft was broken off fifteen feet from the ground, but it will be repaired at the company's expense.

How to Buy a Statue Cheap.

It is told of the late Edouard Pailleron, who was no less notorious as an art collector than as a dramatist, that he fell in love with a beautiful "Baigneuse," in white marble, executed by Schoenewerk, and offered to purchase it at the sculptor's own price, says the "Stonemason." "Unluckily," replied the latter, "I have sold it this very morning to the municipality for a prize in the town lottery." "That is all right," rejoined Pailleron; "your 'Baigneuse' will soon be mine." "Have you made a bet to that effect?" asked the sculptor. "Not at all. In these big lotteries, as a rule, the fine works of art are always won by Philistines. Margaritas ante porcos. Having not the least idea what to do with their prizes, these worthy people hasten to turn them into hard cash. In the case of your lovely statue I shall be the transmutor of marble into gold." Sure enough, when the lottery was drawn, a Paris cabman proved to be the winner of "La Baigneuse." Pailleron, who had carefully watched the prize lists as they appeared in the newspapers day after day, obtained the lucky jarvey's address from the administration of the town lottery, and hunted him up without an hour's delay. Being rich enough to indulge his fancy when an objet d'art was in question, he had made up his mind beforehand—if it might not better be—to loosen his purse strings to the extent of 25,000 francs (£1,000), at which sum he had appraised the value of Schoenewerk's masterpiece. Greatly to his joy, however, the winner of the statue modestly priced it at 4,000 francs (£160), about a sixth of its marketable worth. Pailleron closed with Jehu on the spot, and carried off "La Baigneuse" in triumph. In after years he always spoke of it as the gem of his collection, and the

best bargain he had ever made. At the time of his lamented decease, some ten days ago, it had been in his possession for just twenty-one years, and it will probably be purchased by the State should the Pailleron collection come to the hammer.

Iron Houses for India.

The suitability of this class of houses for the hills has recently been discussed in Simla, and they will probably be given a trial there ere long, says "Indian Engineering." They would, it is believed, answer very well as summer residences, and would be damp-proof in the rains. It is said that they can be brought out from England according to the design and measurements supplied by the purchaser, and fixed together on the site for a less sum of money than it now takes to build a house of the same dimensions in the ordinary dhujjii style at present the fashion. Moreover, they would cost next to nothing in the way of annual repairs. But it is questionable if they would make warm winter houses, even as mere shells to a timber interior as proposed. Experiments might be made with them on the sites, which, we hear, are to be opened up at Chota Simla for the Punjab Government officials, who come up late, and leave again for Lahore long before the cold weather sets in. Two or three iron houses which, we understand, have been put up at Missouri seem to be giving satisfaction to owners and tenants alike.

Vicissitudes of an Indian Engineer.

The Deputy Commissioner, Nowgong, Assam, offers a reward of Rs. 50 for the destruction of a rogue elephant, at present at large in Lumding, Fifteenth Division of the Assam-Bengal Railway, says "Indian Engineering." The notice runs: "The elephant is a terror to the neighborhood, and has chased the Assistant Engineer of the Assam-Bengal Railway while he was looking out for deer near his bungalow. It has also caused some damage in the village clearing, and alarmed the Nepalee golas." The description of the elephant is as follows: "It has only one tusk, or at any rate one tusk is much larger than the other."

The Slate Trade

Pennsylvania Slate Notes.

A Slaters' Union has been organized at Edelmans, with a membership of 42.

During the month of June 255 carloads of roofing slate, or about 15,000 squares, were shipped from the Pen Argyl quarries over the Bangor & Portland railway. This was an increase of twelve carloads over June, 1898.

The Hower Slate Company, of Danielsville, is advertising for additional men. This company, the largest in the Danielsville region, now employs 190 men in its quarry and factory, although the quarry has never been worked to its full capacity, owing to the inability to secure sufficient men in that section.

The proposed deal by which Henry Parsons, of the firm of Parsons Bros., operators of the Golden Rule quarry, was to dispose of his one-fourth interest to Bangor parties, and a new company organized, has been declared off. Mr. Parsons will remain in the firm with his brothers, and the operation of the quarry will be pushed more vigorously than ever.

The Blue Valley Slate Company has elected the following directors: Thomas Johnston, Frank D. Bittner, James F. Hunsicker, L. H. Yeager, Reuben Hellrich, Robert F. Muschitz and James L. Foote. The company has a yearly output of 600,000 school slate, 50,000 blackboards and 7,000 squares of roofing slate.

The old Delabole Slate Company, which is opening a new quarry at Delabole, has erected hoisting machinery.

W. T. Allen has made arrangements to resume operations at his White Oak quarry near Edelmans, which has been idle for some time. The White Oak is one of the best flagging and roofing slate quarries in the hard vein section.

Thomas Jackson has brought suit in equity against Richard Jackson, Jr., Richard Jackson, Sr., John Jackson and Joseph Welsh, his partners in the Jackson Slate Company, operating the St. Ethel quar-

ries, for an accounting and a dissolution of partnership.

A new company has been formed to operate the Golden Rule quarry.

The Bangor Superior Slate Company has been reorganized, and the following directors elected: Lorenzo Pearson, J. C. Pearson, Solomon Flory, William Speer, David Stoddard, John Bennett and William Beck. The officers are: David Stoddard, president; Lorenzo Pearson, secretary, and Solomon Flory, treasurer.

The demand for slate exceeds the supply, and exporters are experiencing great difficulty in securing enough slate to fill their orders. One exporter has brought suit against a Pennsylvania quarry, claiming that the quarry sold the slate to another party at a higher figure than stipulated in a contract with the exporter. Prices for all grades of slate are very firm.

Fair Haven Correspondence.

Fair Haven, Vt., July 11, 1899.

The New England Marbleized Slate Mantel Company have just issued a small circular calling attention to their particular lines of marbleized slate work. They are doing a good business through their London agent, as their goods find a ready sale in Europe.

An order from Natal, South Africa, has been received in town and is now in process of manufacture.

Minogue Bros. & Quinn have just had set in their slate mill a new rubbing bed, "Shortsleeve's patent." So far it has given satisfaction.

Mr. Davis, of the Vermont Slate Syndicate, was in town at his local office. He has just arrived from London, Eng., where is situated the main office and wharves. Mr. Davis reports the trade good. The syndicate is managed here at their local office by Mr. Wright.

The Scotch Hill Slate Company report business as brisk. They are shorthanded,

as mill hands are scarce. This firm has recently shipped some slate lavatory work to Cuba, to be set up in the Havana custom house.

Mr. Isles, of Cheapside, London, Eng., was in Fair Haven the past week in the interest of a slate syndicate. He was pleased with the quality of American slate and American workmanship and predicts increased sales for our goods.

The roofing slate quarries in this slate belt are exceedingly busy, large orders being received daily for shipment abroad. It would seem that the time had arrived for the slate business to get some little pecuniary benefit by advancing prices somewhat. Quarries have to pay increased price for tools, etc., and should now receive some encouragement for the years of depression they have passed through, many of them having run their quarries at a loss.

G. B. B.

Tennessee.

The large slate quarries at Tellico Plains will soon be in operation, under the management of Thomas Wans, a slate expert from Wales. There are three varieties of slate at the quarries—the green, purple and black.

Chimneys and Their Flues.

There is a large measure of truth in the statement that nearly three-fourths of all the fires that occur in dwelling houses as well as in many other buildings have their origin in defective flues. This percentage could be greatly reduced if the builder would exercise a little more care in the construction of his chimneys and the proper distribution of the wood work around them. Chimneys should be built from foundation to coping clear and independent of any wood work. Where the stack passes through a floor or roof, the trimming timbers should work clear of the brick or stone work at least one inch, and the roof boards and flooring should clear the stack nearly as much. The slate or shingles will of necessity be close to the brick work, but should be so put as not to interfere with the chimney's settling—for all chimneys will settle a little—for should the roof covering prevent the upper part of the chimney from settling along with the lower part, the stack will break at the line of junction with the roof, and the crack may be large enough to admit sparks and smoke, and the house may take fire from this cause. The same argument applies

WANTED THESE BACK NUMBERS OF "STONE."

The demand for complete sets of STONE has exhausted a few of the numbers of which the supply was limited. A number of those heretofore advertised for have been furnished in sufficient quantities, but the following are needed to complete files:

JUNE	1892	NOVEMBER	1894
OCTOBER	1892	FEBRUARY	1895
JANUARY	1893	MARCH	1895
FEBRUARY	1893	APRIL	1895
MAY	1893	JUNE	1895
JULY	1893	JULY	1895
DECEMBER	1893	MARCH	1896
JANUARY	1894	NOVEMBER	1896
MARCH	1894	NOVEMBER	1898
SEPTEMBER	1894	FEBRUARY	1899
OCTOBER	1894		

If any reader of STONE does not bind his copies of the magazine and is willing to supply these needed numbers, his subscription will be extended copy for copy for any of the above numbers sent to this office. That is, for any one of the issues one month will be added to the subscriber's term.

FRANK W. HOYT,
No. 45 Broadway, New York City.

to the floor; the wood work must be kept clear of the chimney. In discussing this subject a writer in the "Canadian Architect and Builder" says that no flue should be less than 8x8 inches, or the length of one brick square in the clear, and this size should be maintained from bottom to top, regularly built—not contracted at some points and expanded at others. The walls adjacent to the flue should be laid close, and every joint of the bricks slushed or entirely filled up with mortar.

The inside of the flue should be well pargetted or plastered with mortar that will adhere to the bricks; simple lime and sand mortar will not be effectual, although used in common, if not almost universally. When the flue becomes heated, which it will at times, common mortar will peel and chip off and leave the joints exposed for the admission of smoke and fire, and at points where the wood work, such as flooring or timbers supporting the same, approaches too near the brick work of the flue, it will ignite, and the fire will extend between the floor and ceiling along the joists, and have control of the building before it is visible to outsiders or inmates of the house, and the building is either seriously damaged or entirely destroyed for the want of a little care and attention in the construction of the flue.

Pargetting mortar should be made with a portion of cow's hair in it, in about the same proportion as used in mortar intended for the first coating of wall plastering. Horse manure, in about the same proportion as cow's hair, thoroughly mixed with the lime and sand mortar, makes a very effectual pargetting, and when well put on will remain as long as the flue lasts. As a further safeguard, at the intersection of floors and roof the thickness of the flue walls might be swelled out so as to give a thickness of walls at these points of not less than eight inches. There is no constructional difficulty in this, and the chimney would be rendered doubly safe.

A perfectly safe flue may be made by using ordinary glazed drain tiles of sufficient size for the flue, building them in as the chimney is being constructed. These may be obtained in suitable sizes, and T lengths can be had, which may be inserted in the flue, leaving the wing or third part to project through the wall for the reception of stove pipes, or for admission of air for ven-

tilation purposes. A flue constructed with tiles in the manner suggested would be as near perfection as it is possible to build a flue.

Madrid and Its Architecture.

The great distinctive feature of Madrid which will at once strike the architect who visits this town is what we may term the wonderful liberty of architecture enjoyed in the capital of Spain, says the "Illustrated Carpenter and Builder." In this Madrid affords a favorable contrast with Paris. At first the traveler is impressed with the grandeur of Paris, the magnificence of its boulevards; but gradually it dawns upon him that these splendid boulevards are all alike; that the houses are all built after the same model; that there is hardly any variety and play for the imagination. The Boulevard St. Germain is almost identical with the Boulevard Magenta, its senior by a few years. Whether situated in the north, the south, the east, or the fashionable west, all the new boulevards of Paris are appallingly alike, one to the other. At last a natural reaction sets in, and the visitor, in despair, seeks to relieve his eyes in the narrow streets of the Isle St. Louis, attempts to unearth some remnants of the historical Quartier Latin, or else loses himself hopelessly in the marais. At Madrid there is no necessity for any such violent measures, and the visitor need not seek out eccentric quarters of the town to find a little variety. The fashionable districts, such as Prado, consist—apart from the trees, the fountains, the carriage-drives, etc., which constitute the promenade—of a succession of what the Spaniards delight in describing as palaces. In England we should, more modestly, term these structures large houses, or, at best, mansions; but in Spain the grandest term the language can afford is always preferred. Nevertheless, it must be admitted that some of these mansions are very beautiful and grandiose in their proportions. The chief charm, however, rests in the variety of designs and structure. If a rich man be fortunate enough to secure a plot of ground, he will combine with his architect some special plan particularly suited to his fancy and convenience, maintaining at the same time a strict watch on his neighbors, so that his house should not be out of keeping with theirs.

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- 24" x 28" x 5' Planer.
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- 30" x 30" x 9' Pond.
- 30" x 30" x 10' Bretelle.
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Limes and Cements

The Treaty Creek Stone and Lime Company, of Wabash, Ind., has disposed of its property to J. P. Smith, of Fowler, Ind., and George Hubbard, of Martinsville, Ind. The company was organized in 1874, and has been engaged in the manufacture of lime, lumber and all kinds of building material. The consideration named in the transfer is \$70,000 and the new owners will take possession at once. John B. Latchem, president of the company, will become manager of the Wabash bridge and iron works, in which he is a heavy stockholder.

Jacob Pringle, of Madoc, Ont., met with a horrible death by falling into a lime kiln where he was working.

J. J. Hoblitzell, of Hyndman, Pa., has stopped operating the lime kilns at that place. D. S. Evans, the owner of the land, will run the kilns.

The Southern California Marble & Lime Company has been incorporated. Principal place of business, San Bernardino. Directors: B. H. de Jersey and F. W. Armitage, Ontario; Henry Ingram, San Bernardino, and H. O. Maynard and H. F. Bradburn, Los Angeles. Capital stock, \$100,000; subscribed, \$500.

Perry Bros., of Rockland, Me., are having a large addition made to their lime shed. When completed the structure will be 360x240 feet in size.

A strike among the quarrymen at the Potomac Cement Works at Pinto, Allegany county, for an increase from \$1.15 to \$1.25 a day has resulted in the company, which refused to accede to the demand, in placing colored men in the places of the strikers.

Fry & Hatfield have started a new lime kiln at Savanna, Ill., and are meeting with good success.

John Armstrong has put a new rock-crusher at his quarry, at Alton, Ill., and has completely overhauled his lime kiln.

Leedham and Anthony White, C. B. E. Cheffins and Robert Carling, English cement manufacturers, are looking at Mich-

igan and Pacific Coast cement mills, with a view to investment.

The Omega Cement Company, of Reading, Mich., has been reorganized.

The Babcock-Merrifred Company, of Grand Forks, N. D., are erecting a new Portland cement plant at McLean, N. D.

New York capitalists are erecting cement works at Plattsburg, N. J.

Cement manufacturers making either natural or Portland cement report that they are flooded with orders. This satisfactory condition obtains in all parts of the country. The manufacturers say that they have enough contracts to keep them busy until January next.

Opening for American Cement in Scotland.

Mr. Rufus Fleming, the American Consul at Edinburgh, writes to the State Department:

A recent issue of an American trade journal contains a paragraph on the growth of the Portland cement industry in the United States, in which it is said that—

During the past year, the leading manufacturers of Portland cement have begun to cultivate systematically the export field, and there is no question that soon American Portland cement will be laid down in large quantities in many foreign markets.

Cement is extensively used in Scotland. The imports of this article at the port of Leith are annually from 55,000 to 65,000 tons. It comes chiefly from England, although Belgium furnishes a considerable quantity.

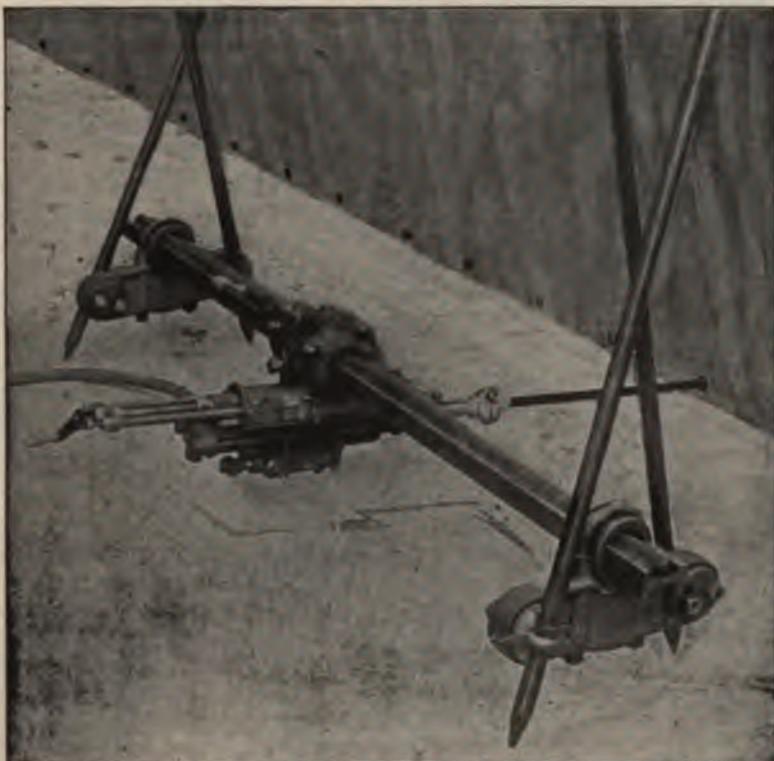
A commission agent called at this consulate a few days ago to make inquiry about American manufacturers of Portland cement. I gave him the names of several companies. If the article can be delivered here at a reasonably competitive price, it should soon get permanently into the market, as American roofing slates have done during the last ten months.

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Contracts and Building

Government Work.

Albuquerque, N. M.—Proposals will be received until July 31 for water and sewer system for the Albuquerque Indian Industrial School. Edgar A. Allen, superintendent of Indian Schools, Albuquerque, N. M.

Boise, Ia.—Bids will be received until August 7 for the erection of a Government building here. James Knox Taylor, supervising architect, Washington, D. C.

Buffalo, N. Y.—Bids will be received until August 3 for the low pressure and exhaust steam heating and mechanical ventilating apparatus, etc., the cold and hot water supply systems, etc., for the United States post office building at Buffalo, N. Y.

Cheyenne, Wyo.—Bids will be received until July 27 for the superstructure, interior finish, plumbing, approaches, etc., for the United States public building at Cheyenne. James Knox Taylor, supervising architect, Washington, D. C.

Cleveland, O.—Bids will be received until August 5 for the erection of a boilerhouse and stack for the United States Marine Hospital at Cleveland. James Knox Taylor, supervising architect, Washington.

Fort Adams, R. I.—Bids will be received until July 26 for the erection of a hospital building at Fort Adams. E. W. Hubbard, Q. M.

Morris, Minn.—Proposals will be received until July 27 for one brick dormitory and one brick school building at the Indian School. Wm. H. Johnson, superintendent Indian School, Morris, Minn.

Oakland, Cal.—Bids will be received until August 9 for the construction of a steel highway drawspan bridge and piers, with approaches, across the tidal canal at Oakland Harbor. Major W. H. Hener, U. S. engineer, Flood building, San Francisco.

Warm Springs Agency, Ore.—Bids will be received until August 7 for construction of an electric light plant at the boarding school here. James Cowan, U. S. Indian agent, Warm Springs, Ore.

Washington, D. C.—Bids will be received until July 29 for constructing sewers, as follows: Two sections of the east side intercepting sewer; extension of boundary sewer; Quincy street sewer, Petworth; extension of sewer in Trinidad avenue; sewers in Lanier Heights subdivision. John B. Wight, John W. Ross, Lansing H. Beach, commissioners.

Churches and Chapels.

Accokeek, Md.—The Episcopal Society will build a stone church. Ghequier & May, Philadelphia, architects. Rev. T. Smoot, rector.

Buffalo, N. Y.—Plans for the expenditure of \$25,000 in improving St. Joseph's Cathedral are being made. Marble floor and wainscoting will be put in. The wainscot will extend to the windows. Rev. John D. Riden, rector.

Champaign, Ill.—Vredenburgh & Ice are preparing plans for a \$10,000 church for the German Lutheran Society.

Cherokee, Ia.—The Congregational Society will erect a \$15,000 church.

Chicago, Ill.—The Polish Roman Catholic Society, St. Mary of Angels, will build a \$75,000 church and school at Hermitage avenue and Clybourne place of brick and stone. A. Druiding & Co., 163 Randolph street, architects. These architects have also prepared plans for the erection of a \$15,000 mausoleum to be erected in memory of Rev. Vincent Barzynski by the Polish Catholic Society of this city.

Jefferson City, Mo.—The M. E. Society will build a \$15,000 church.

Kansas City, Mo.—The Beacon Hill Congregational Society will erect a \$25,000 church. F. B. Inger, architect. Dr. J. H. Crum, pastor.

Kosciusko, Miss.—Bids will be received July 25 for building a brick and stone church for the Presbyterian Society. John M. Fletcher, secretary.

Norfolk, Va.—E. M. Tulley, of Berkley, will build a \$20,000 church across the river

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from Norfolk. The building will be presented to the Chestnut street M. E. Church.

Oshkosh, Wis.—Plans have been accepted for a \$75,000 church to be erected by the Congregational Society. Rev. E. H. Smith.

Pittsburg, Pa.—W. Ross Proctor has prepared plans for a \$12,000 parish house to be erected by Trinity Episcopal Society. Rev. A. W. Arundel, rector.

St. Louis, Mo.—The St. James Episcopal Society will build a \$30,000 church at Goode and Cote Brilliante avenues. Evarts Tracy, 156 Fifth avenue, New York City, architect. Rev. E. Duckworth, rector.

Sault Ste. Marie, Mich.—The St. James Episcopal Society proposes to build a \$15,000 church. Plans have been submitted by Charlton, Gilbert & Demar, of Milwaukee. Rev. Wm. Johnson, rector.

Seattle, Wash.—The Church of the Sacred Heart of Jesus has accepted plans for the erection of a \$30,000 church. Rev. Thomas Brown, pastor.

Upper Sandusky, O.—The trustees of the Presbyterian Society have accepted the plans prepared by Yost & Packard, of Columbus, for the proposed church.

Wabasha, Minn.—Thomas Irvine, of St. Paul, has decided to build a Memorial Episcopal Church at Wabasha. Rev. J. J. Hilmes, Winona, pastor in charge.

Schools and Colleges.

Alton, Ill.—The school board authorized a \$10,000 school to be erected in the east side of the city.

Burr Oak, Kan.—Plans have been accepted for building a \$7,000 school house.

Cleveland, O.—The Beth Hamidrash Hagodal Israel Congregation will build a school.

Columbus, O.—Plans have been accepted by the trustees of the Ohio State University for a \$70,000 law-school building.

Duluth, Minn.—Palmer, Hall & Hunt are preparing plans for a normal school to be erected here at a cost of \$80,000.

Frederick, Md.—The Catholic Order of the Society of Jesus, now located at Frederick, has purchased a site near Poughkeepsie for erecting of new buildings. Rev. John O'Rourke, rector, Frederick, Md.

Glendale, O.—Bids will be received August 7 for building a nine-room school house. Architects: Brown, Burton & Davis, Cincinnati. Henry L. Woodward, clerk of board.

Hayward, Wis.—The location of the new school to be built for the Chippewas on the Lac Court Oreilles reservation was decided by Indian Commissioner Jones. The act of Congress provided that the school should be located at or near Hayward. The school is to cost \$60,000 and work on the plans will be started at once.

Highland Park, Ia.—Dillie & Rearick, proprietors of the Highland Park College, have completed arrangements for the making of about \$24,000 worth of improvements and additions to the property.

Hortonville, Wis.—Architect Herman Wildhagen, of Appleton, has prepared plans for a school house here of brick and Bedford stone. Cost, \$7,500.

Longview, Ill.—R. Z. Gill, of Urbana, is preparing plans for a school to be erected at Long View.

Mandan, N. D.—Bids will be received August 7 for building a school in Sevenson school district. Don. Stevenson, clerk.

Mount Vernon, O.—Bids will be received July 30 for the construction of a school in District No. 8, Clinton township. H. W. Hill, clerk.

Muskegon, Mich.—The sum of \$15,000 has been voted to build a new school.

Philadelphia, Pa.—E. F. Duran has prepared plans for a \$175,000 school to be erected on Chestnut Hill, for the Academy of St. Joseph.

The Committee of Education will advertise for bids for the erection of school buildings in the Thirteenth, Thirty-ninth and Thirty-seventh wards. The buildings will contain fifteen rooms each.

Pullman, Ill.—Press reports state that the Pullman estate will erect the proposed manual training school at Pullman.

Salt Lake, Utah.—A \$50,000 building will be erected for the Sheldon Jackson College. Dr. R. G. McNice, president.

San Diego, Cal.—Plans and specifications are being prepared for a laboratory building for the Normal School. W. R. Guy, trustee.

Trenton, N. J.—Architect William A. Poland, of Trenton, N. J., has prepared plans and specifications for the erection of an industrial school for girls at Trenton, N. J. This will be a face brick and stone building, with iron frame.

West Bend, Wis.—The School Board has decided to build a \$12,000 school.

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Business Buildings and Residences.

Baltimore, Md.—The plans for the projected 12-story building to be occupied by the Continental Trust Company at Calvert and Baltimore streets, will be drawn by D. H. Burnham & Co., of Chicago.

Boliver, Pa.—The United States Enamelled Brick Company has been incorporated and will enlarge the experimental plant of the Reese Hammond Fire Brick Company. Leonard Roden, general manager.

Buffalo, N. Y.—W. H. Archer has prepared plans for a \$35,000 apartment house on Porter and Archer avenues. Marble, mosaic work, plate and stained glass. Earnest C. Coltes, owner.

Cincinnati, O.—A 17-story office building will be erected on Fourth and Walnut street, by the Union Savings & Trust Co. Work will be begun Oct. 1.

The Stewart Iron Works, makers of architectural iron work, will enlarge its plant.

Cleveland, O.—A new brick company is being organized in opposition to the trust. M. A. Bradley is one of the largest stockholders.

Crystal Lake, Ia.—Two new banking buildings, of brick and cut stone, will be erected here by the Lake Crystal Bank and the First State Bank. Omeyer & Thori, of St. Paul, architects.

Doliver, Ia.—A double business block of pressed brick and cut stone, with granite columns, will be erected here, at a cost of \$10,000. Omeyer & Thori, of St. Paul, architects.

Ilchester, Md.—Plans are being prepared by Lynn & Greenway, architects, of Boston, for the large mill to be erected in connection with the Thistle mills here. It will be 225x387 feet, two story, and constructed of brick, iron and stone.

Kansas City, Mo.—Mrs. Ermine Carr will erect a four-story warehouse at St. Louis avenue and Liberty street, for the Newby Transportation Company, whose warehouse was destroyed by fire. George Mathews, architect.

Lorain, O.—The new Steam Shovel Company, and the American Shovel and Stamping Company, will locate here and erect several large buildings.

Ludington, Mich.—The elevator of the Flint & Pere Marquette Railway, recently burned, will be rebuilt.

Meridian, Miss.—The plant of the Meridian Fertilizing factory, recently burned, will be rebuilt. S. Eastland, secretary.

Minneapolis, Minn.—Plans are now being prepared for the additions to the Minneapolis rolling mills and work will be commenced on the construction of the additions as soon as possible. The additions will not cost less than \$100,000. With the proposed additions the capacity of the plant will be doubled.

Pittsburg, Pa.—The Mica Machine Company will be incorporated by Richard A. L. Snyder, Frank Semple, Jr. The company will erect a large plant as soon as the charter is granted.

Rochester, N. Y.—E. P. Reid Shoe Company will erect a five-story business building on River street near North St. Paul street. Ellsworth & Grant have the contract for the mason work.

Salt Lake City, Utah.—Frank M. Wilson has purchased a site on South Main street for \$50,000 for the erection of a six-story \$100,000 business building.

St. Louis, Mo.—The Anheuser Busch Brewing Association will build a \$20,000 dry house four stories, brick, stone and iron work.

St. Louis, Mo.—A six-story office building of pressed brick and Bedford stone will be erected by B. Nugent & Bros., of Washington avenue, at a cost of \$75,000. Barnett, Haynes & Barnett, architects.

Washington, D. C.—Architects Hines & Le Farge, of New York, have prepared plans for a residence of Colonial style, for Gifford Pinchot, at 1615 Rhode Island avenue. In the basement will be a room for an automobile with a driveway to the street.

Architects Totten & Rogers have prepared plans for a dwelling of brick and Indiana limestone for James C. Hoe at Nineteenth street and Pennsylvania avenue.

A. P. Clarke, Jr., has prepared plans for a brick and stone residence for Dr. George N. Acker, at 913 Sixteenth street, northwest.

County Buildings, Depots, Opera Houses, Hotels, Hospitals, Etc.

Agricultural College, Mich.—Pratt & Keoppe, of Bay City, are preparing plans

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for building a four-story dormitory for the college. Estimated cost, \$83,000.

Cedar Rapids, Ia.—There is over \$12,000 subscribed toward the erection of an auditorium building.

Duluth, Minn.—A new building, to cost \$30,000, will be erected by St. Luke's Hospital.

Durand, Mich.—The Grand Trunk and Ann Arbor railroads will build a passenger station here at a cost of \$30,000.

East St. Louis, Ill.—The East St. Louis Relay depot station has decided to build a \$200,000 depot. W. S. McChesney, Jr., St. Louis, superintendent of terminals, Louisville and Nashville railway, is one of the committee appointed to secure plans and specifications.

Fort Dodge, Ia.—The Midland Insurance Company will build an opera house this season. Estimated cost, \$25,000.

Fort Wayne, Ind.—The Allen County Commissioner will receive bids August 3 for two additional buildings at the County Orphan Asylum. William Meyer, Jr., auditor.

Gallipolis, O.—An industrial building for women will be erected by the Ohio Hospital for Epileptics. Plans have been prepared by Yost & Packard, of Columbus. Bids will be received up to July 27.

Hartford, Conn.—The American School for Deaf and Dumb, on Garden street, will erect a \$40,000 additional building this summer.

Indianapolis, Ind.—The Indianapolis Catholic Hall Association has been incorporated to build a Pythian Hall on East Market street. Capital \$100,000. Wm. Hugo, E. P. Harm, J. A. Hamilton.

Jamesville, N. Y.—The contract for the new penitentiary at Jamesville has been awarded to Frederick E. Le Strange, of Syracuse, at \$191,954.

Jeffersonville, Ind.—A new cell house of 600 cells will be erected at the Indiana Reformatory. Clarke & Loomis, of Louisville, architects. Bids will be received by the general superintendent up to August 1.

Kenosha, Wis.—Charles A. Dickhant is preparing plans for a hotel to be erected on West Main street by E. H. Fransden.

Menominee, Mich.—H. C. Koch & Co., of Milwaukee, are preparing plans for a Turner Society building and opera house.

Marquette, Mich.—Charleton, Gilbert &

DeMar, Milwaukee, have prepared plans for a two-story addition to be erected to the Peter White Library, at Marquette.

Neenah, Wis.—William Hesse and W. M. Gilbert have been appointed a committee to arrange about building a \$15,000 opera house and society building for the Modern Woodmen.

New Whatcom, Wash.—Edward Fisher has prepared plans for building an opera house to be erected on Prospect street.

Pullman, Wash.—A. E. Barrett, of Tacoma, Wash., secured the contract to construct Ferry and Stevens halls at the agricultural college, for \$74,000. George Wesley Bullard, of Tacoma, architect.

Rutledge, Tenn.—The Granger County Court has appropriated \$5,000 to build a new jail.

Sandusky, O.—Lehman & Schmidt, Cleveland, have prepared plans for the proposed children's home to be erected by the county.

Seattle, Wash.—J. C. Spurr secured the contract to erect the boys' dormitory at the university, for \$21,228, and Hanley & Lohse secured the contract for the girls' dormitory at \$24,613.

Sioux City, Ia.—St. Joseph's Society will erect a hospital at a cost of \$30,000. Buechner & Jacobson, of St. Paul, are preparing plans.

St. Louis, Mo.—Architect J. L. Wees, 520 Olive street, is preparing plans of the addition to the Homeopathic Hospital at Jefferson and Howard streets, which will be erected at a cost of about \$40,000. The new building will cover a space of 100x90 feet, and will include a four-story hospital with fifty rooms, and a two-story amphitheater. The new hospital will be completed by about next February.

St. Paul, Minn.—Press reports state that the Great Northern road will build twenty stations in Minnesota and Dakota this summer.

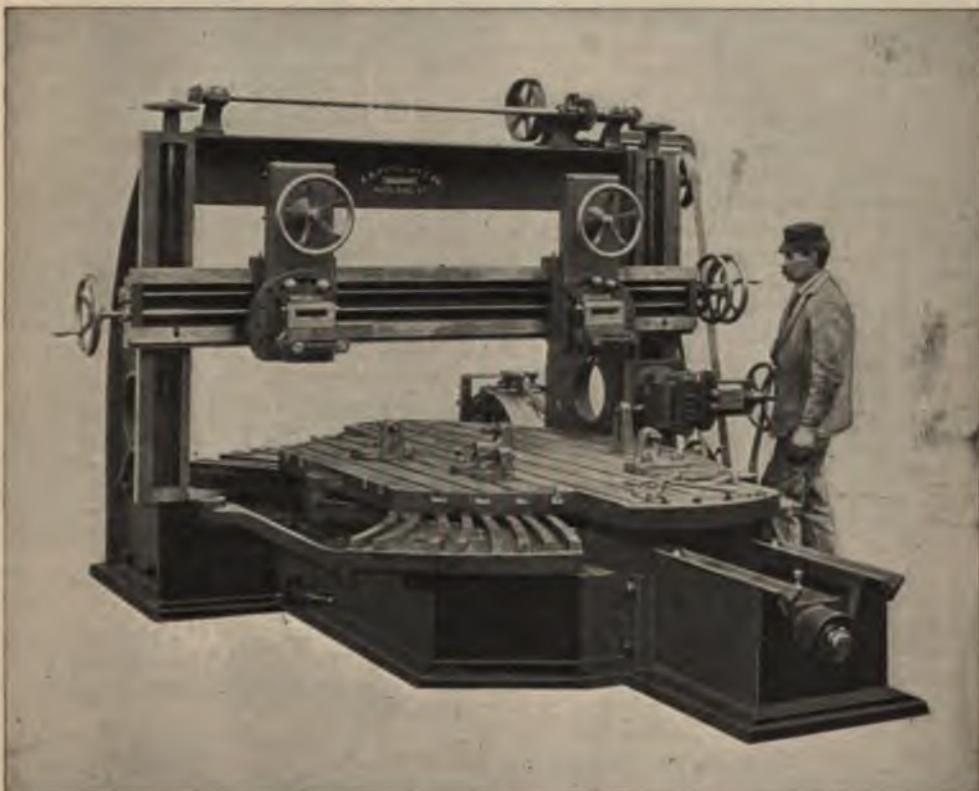
Titusville, Pa.—Capt. George W. Barber, of Akron, O., has secured an option on the Mineral Springs at Titusville and expects to build a \$75,000 sanitarium there.

Troy, N. Y.—Fred M. Cummings is preparing plans for the proposed depot to be erected by the Troy Union Railway Company.

Waterloo, Ia.—The B. C. R. & N. railway will build a depot.

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Bridges.

Alliance, O.—A 200-foot bridge is to be built by the Pennsylvania company, at Alliance. It will cross the Fort Wayne tracks at that point.

Battlecreek, Mich.—The Common Council has decided to construct the bridges within the city of stone and iron and will at once commence by rebuilding the South Jefferson street bridge.

Billings, Mont.—The Yellowstone County Commissioners will receive bids August 15 for a four-span Howe truss bridge across Yellowstone river at Laurel.

Bowling Green, O.—Bids will be received until July 28 for the new bridge across the Maume river at Grand Rapids.

Cadillac, Mich.—The Manistee river bridge west of Sherman has been declared unsafe by the commissioners of Wexford and Springville townships. It will be taken down and a new one built immediately.

Cascade, Ia.—The Board of Supervisors has decided to build eight bridges.

Detroit, Mich.—The Township Board of Springville and Ecorte, Wayne county, propose to build a \$12,000 bridge across the Rouge river.

Duluth, Minn.—Plans for the steel bridge over the Coffee Creek on the boulevard are completed, and bids will be received until August 10. The piers of the bridge will be built by the board. They will be of masonry.

Hudson, Wis.—The County Board has voted to rebuild the bridge at New Richmond at a cost not to exceed \$5,000.

Louisville, Ky.—The Board of Public Works has decided to spend between \$8,000 and \$10,000 in making approaches and finishing up the incomplete bridge over Beargrass creek at Kentucky street.

Mansfield, O.—The Board of County Commissioners has completed its work of viewing the county to ascertain the bridges and culverts which were washed away by the late storm throughout the county. It is stated that there is at least seven bridges which will be replaced with iron structures. There will also be a large number of culverts and small bridges to replace.

Natchitoches, La.—The Natchitoches Railway and Construction Company has been organized to build a railway and traffic bridge over the Red river at Grand Ecorte.

North Hampton, Mass.—A bridge will be built across the Mill river between Smith and Pleasant streets. It will require 100 feet span of bridge, 100 yards of fill on one side and about ten or fifteen on the other.

Sidney, O.—Sealed proposals will be received at the Shelby County Auditor's office, July 29, for furnishing the material and doing the masonry and other work on an arched culvert over Tilberry Run, on North Main avenue, in the City of Sidney.

Sullivan, Ind.—The Board of Commissioners of Sullivan county will receive bids until August 7 for the construction of substructure and steel superstructure for five bridges; two sixty feet long, one fifty feet long, one thirty-six feet and one thirty feet.

Washington, Ia.—The Washington and Johnson County Boards have agreed to build a bridge at Holland's Ferry. The contract will probably be let in September.

Winterstreet, Ia.—The Madison Board of Supervisors will put in three or four bridges in Ohio township this season. Two of them will be on South river, south of town; one bridge will be east of town.

The Excavation of Babylon.

German archaeologists are busy with plans for the excavation of Babylon. The late Sir Austen Henry Layard, the explorer of Nineveh, was the first one to do anything in the way of excavating Babylon, then Sir Henry Rawlinson followed. The excavations, it is claimed by the Germans, were done in a half-hearted way, and they are determined that their work shall be thorough. It will be very costly, and it is estimated it will occupy five years. It will be carried on by the Orient Society jointly with the directors of the Royal German Museum, and the leader of the expedition is Dr. Robert Koldewey, who has already had much experience in such work. The expeditions will start from Beyrouth, going from there to Aleppo, whence they will travel by caravan to Bagdad. Babylon itself is two days' journey from Bagdad, and consists of rough mounds scattered on the banks of the Euphrates, under which lie the ruins of a great city. The excavators will begin with the fortress which is what remains of Nebuchadnezzar's palace, where Alexander died. In addition to their excavating upon the city site proper they will investigate a number of other ruins situated near.

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Trade Notes



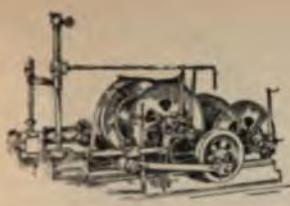
The firm of John Maslin & Son, manufacturing machinists and engineers, 163-167 First street, Jersey City, N. J., has long been well and favorably known. One of their specialties is the Maslin patent automatic steam vacuum pump. This is operated independent of engine or any other motive power, simply requiring a steam pipe from the boiler. It will pump liquids containing mud, sand and other foreign matter without material wear or derangement. It requires very little care, and if left unused for years will start merely by the turning on of steam. It is particularly suited for use in mines and collieries, for lifting water from one level to another, draining galleries, washing, etc., and for quarries and brickyards for draining pits, raising liquid clay and sand. The company also makes an improved centrifugal pump, which is specially adapted for pumping large quantities of water and liquids containing mud, sand, gravel, coal and other foreign substances. This is being used extensively by contractors and mining, irrigation, drainage and wrecking companies. This is made in various sizes, having capacities from 250 to 29,000 gallons a minute. The company also has all kinds of boilers, engines and machinery, both new and second-hand, for sale. Any one in the market for this kind of goods should send for the Maslin catalogue.

The Monon Route sleepers for Indianapolis and Cincinnati, leaving Chicago at 2:45 a. m., have been equipped with electric fans. These sleepers are set in Dearborn station for occupancy at 9:30 p. m., and the electric fans will make them cool and pleasant during the summer months. Get tickets at No. 232 Clark street.

"The Southern Trade Record," in its latest issue, says: "During the past four or five years the South has experienced a growth which promises to become one of the wonders of the closing century. This growth has extended to all lines of industry, and the demand for fine buildings is daily increasing. In response to the nu-

merous inquiries, asking us to give the name and address of some reliable dealer handling the best building stone, we wish to say that our representatives have given close and critical attention to the various dealers in this line. The report of our experts was highly in favor of the building stone produced by the T. L. Fossick Company, whose office is located at Sheffield, Ala. Their mills and quarries are situated at Rockwood, Ala. This company has the largest plant and the best facilities for supplying this stone. We have no interest either directly or indirectly in this company, and only publish this in the interest of our subscribers who have requested the information, and the fact that in the many years "The Southern Trade Record" has been in existence there never yet has appeared a single unreliable indorsement is sufficient guarantee of the one here made. The T. L. Fossick Company is well known for its business and enterprise, and their standing in the commercial world is of the highest order. Therefore, "The Southern Trade Record" unhesitatingly gives this company its editorial indorsement, and takes pleasure in referring all inquirers, as well as those interested directly, to this company for further information, which would be out of place in these columns, as we are sure a company of such high standing can be depended upon to fill all agreements to the letter."

A recently organized company that has already taken a prominent place is the Brewster's Granite Company. The officers of the company are. Hon. Smith M. Weed, president; Amos L. Schaeffer, vice-president; William G. Brown, secretary, and treasurer, and Charles E. Gregory, engineer. The quarries are located at Brewster, while the main office is in the Empire building, 71 Broadway, New York City. The granite furnished by the company is of the highest class, and has met with great favor wherever it has been introduced. One factor that will contribute particularly to the success of the company



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is the location of the quarries. As they are in New York State the stone can be cut at the quarries for all municipal and public work, under the present State law. Being within less than fifty miles of New York City stone of standard sizes can be delivered there within forty-eight hours of the time it is ordered, a most desirable thing in a great many cases. Two handsome churches, one a Presbyterian and the other a Methodist, are now being erected of the Brewster granite at Katonah, N. Y. They are very handsome structures, designed by George W. Kramer, architect, No. 1 Madison avenue, New York, and are being built by W. J. Smith, contractor.

Polishing Marble.

Polishing includes five operations. Smoothing the roughness left on the surface is done by rubbing the marble with a piece of moist sandstone; for mouldings either wooden or iron mullers are used, crushed and wet sandstone, or sand, more or less fine, according to the degree of polish required, being thrown under them. The second process is continued rubbing with pieces of pottery without enamel, which have only been baked once, also wet. If a brilliant polish is required, Gothland stone instead of pottery is used, and potters' clay or fullers' earth is placed beneath the muller. This operation is performed upon granites and porphyry with emery and a lead muller, the upper part of which is encrusted with the mixture until reduced by friction to clay or impalpable powder. As the polish depends almost entirely upon these two operations, care must be taken that they are performed with a regular and steady movement. When the marble has received the first polish, the flaws, cavities and soft spots are sought out and filled with mastic of a suitable color. This mastic is usually composed of a mixture of yellow wax, resin and burgundy pitch, mixed with a little sulphur and plaster passed through a fine sieve, which gives it the consistency of a thick paste; to color this paste to a tone analogous to the ground tints or natural cement of the material upon which it is placed, lampblack and rouge, with a little of the prevailing color of the material, are added. For green and red marbles, this mastic is sometimes made of gum lac, mixed with Spanish sealing wax

of the color of marble. It is applied with pincers, and these parts are polished with the rest. Sometimes crushed fragments of the marble worked are introduced into the cement, but for fine marbles, the same colors are employed which are used in painting, and which will produce the same tone as the ground; the gum lac is added to give it body and brilliancy. The third operation in polishing consists in rubbing again with a hard pumice stone, under which water is being constantly poured, unmixed with sand. For the fourth process, called softening the ground, lead filings are mixed with the emery mud produced by the polishing of mirrors, or the working of precious stones, and the marble is rubbed by a compact linen cushion well saturated with this mixture; rouge is also used for this polish. For some outside works, and for hearths and paving tiles, marble workers confine themselves to this polish. When the marbles have holes or grains, a lead muller is substituted for the linen cushion. In order to give a perfect brilliancy to the polish the gloss is applied. Well wash the prepared surfaces and leave them until perfectly dry, then take a linen cushion, moistened only with water, and a little powder of calcined tin of the first quality. After rubbing with this for some time, take another cushion of dry rags, rub with it lightly, brush away any foreign substance which might scratch the marble, and a perfect polish will be obtained. A little alum mixed with the water used penetrates the pores of the marble, and gives it a speedier polish. This polish spots very easily, and is soon tarnished and destroyed by dampness. It is necessary when purchasing articles of polished marbles to subject them to the test of water; if there is too much alum the marble absorbs the water and a whitish spot is left.—Stonemason.

Gold in Bohemia.

In a paper read before the Geological Institute of Vienna, Mr. A. Irmler described the occurrence of gold at Brazna in Central Bohemia. The veins, which are of a promising character, course east and west in granite for 1,000 meters, and contain antimonite and antimony-glance with a considerable proportion of gold. Mining was actively carried on 100 years ago.



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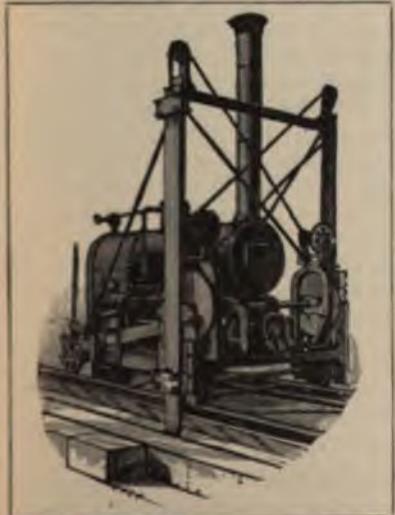
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Dayton, O., July 10.

The handsome new residence of Mr. Valentine Winter is all completed, except the inside work. Messrs. Andrews & Williams, the architects, have made an excellent job, and the mechanics of the city give them full credit.

A new barracks will be put up at the National Soldiers' Home, and it will be one of the largest of all. The stone work went to Mr. L. H. Webber. Mr. Webber also got a contract for stone work from Mr. Steel, of Xenia, O., for a building of pressed brick with stone trimmings. Other contracts that Mr. Webber has secured are for District No. 10 schoolhouse addition, the addition to Mr. Wolf's tobacco warehouse, and a pressed brick and stone trimmings residence on Van Buren street for Mr. Eckhard.

Mr. Bruno Rittie was awarded the new rip-rap wall on the Miami river. This will be a gigantic job.

Mr. E. H. Talbott was awarded the stone work of the West End school for \$1,800. He also has a contract to cut stone for a new central station house, at No. 249. Mr. Jacob Zabler & Sons have the rubble work for the same job at \$275.

The B. C. A., at its regular meeting, granted the contracts for the erection of a steel girder bridge across the Miami and Erie canal feeder at Wayne avenue, and for two stone abutment walls. The contract for the bridge went to the King Bridge Company, of Cleveland, at \$3,983, and for the abutments to Mr. F. Kroemer, at \$395.20.

Mr. Hornbrook, of Wyoming, O., got the contract for the construction of the new Union depot at Holl for \$155,000, and the work is progressing fast.

Mr. E. H. Talbott has a sub-contract for the mason work. The building will be three stories high, of pressed brick and Bedford stone. The congregation of St. John's German Evangelical Lutheran church will erect a new edifice on the site of the present ruined structure on East Third street. Since the old church was

burned down, some time ago, the members were undecided whether or not to rebuild, remodel, or look elsewhere for a new location. Finally they decided to rebuild on the old site.

The enormous plant of the National Cash Register Company, one of the biggest industries of its kind in the world, is to be still further enlarged. A permit has been granted the company to erect a two-story addition to the plant, and it will be of steel frame work. A Cleveland firm got the contract. It is understood that in the near future the company will erect a new five-story building of very large size, in the rear of the present factory.

FRANK D'ONOFRIO.

Cleveland, July 5.

There is no material change in the situation here since my last report; in fact, work is slackening off with little prospect of brightening up this fall. I have it from good authority that the Cathedral will not start until next spring or summer. Donations and subscriptions are slow in coming in, and the building committee has decided to wait until it is positive that the money will be ready. The East End High School has now started, but is moving slowly, owing to the scarcity of brick, caused by the concerted action of the brickmakers, who have combined and limited the output of each member. The approximate cost of the school will be \$150,000, and of this only \$12,000 is for cut stone, material and labor. The South Side High School will be advertised in the course of a month or six weeks. The architect is now working on the drawings. The Harmon Street Grammar School was let two weeks ago. It will cost \$50,000 and the cut stone bid for material and labor was \$1,975.

The park and boulevard bridge under St. Clair street was let to J. Soudar on his bid of \$61,470. Nothing else of importance is in sight.

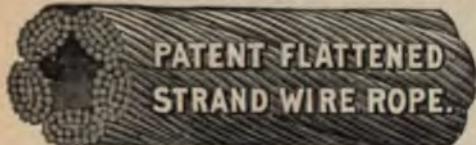
D. GWILYME GEORGE.

Dixon, Ill., July 12.

The stone industries in and around Dixon have been very prosperous this season. A great many houses are being built, a number of miles of hard road are being

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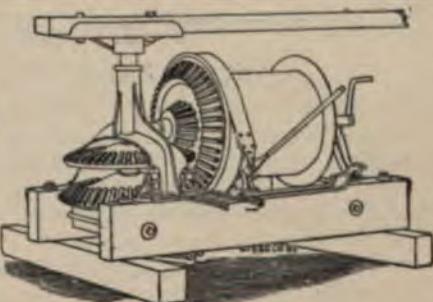
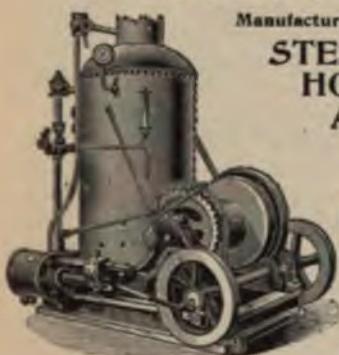
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constructed and a great deal of cement walk laid. There is no other town in the State that is better supplied with stone roads nor that devotes more attention to their construction. Few towns are more abundantly or more conveniently supplied with good material. The city authorities are now negotiating for a new sixteen-ton steam roller. The firm of Rink & Gaffney have crushed 6,000 yards of stone, and placed it on the roads. Duffy & Hubbard, another stone-crushing firm, have built a mile of road towards Pine Creek, and are now putting in a mile on the Grand Detour road. They will next construct one and a quarter miles in Palmyra township. Other contracts are in sight for both firms.

The quarries are all busy. Lloyd's quarry has been recently opened and supplies all the trade southwest of Dixon. The Lowrie Bros.' quarry has furnished 300 cords of building stone in Dixon, and are now shipping to Sublette. Other quarries will be visited later.

J. A. LLOYD.

A Gigantic Statue.

A giant statue of Cadillac, the founder of Detroit, probably will be a leading feature of the exhibition which that city is to give this year in honor of its bicentenary. A plan is under consideration by the city council by which the statue, 250 feet high, is to be erected on Belle Isle, a small island in the lake just outside the city. It is to be really a great building in the shape of a man.

The plan was suggested by David D. Buick, of Detroit. His proposition is to put up a large building with the outward appearance of a man, a giant statue of Cadillac. This giant would represent the growth of Detroit. The style of the boots of the statue will make the smallest part of the figure at the ankle about twenty-five feet through, and would make practicable a plan of elevator service through the center of each leg.

The style of dress represented would make it possible to have the first floor 100 feet from the base. This would be known as floor "A," and would be seventy-five feet in diameter. The floor next above would be called floor "B," to be about the same size, with an additional room in one arm about twenty-five feet in diameter.

The main room on floor "C" is to be about the same dimensions as floor "A," but with the addition of two side rooms, one in each arm of similar proportions to the side room on floor "B." Floor "D" is to be a counterpart of floor "C," with rooms about twenty feet high. Floor "E" is to be about 107 feet in diameter, and to be used as a convention hall. Floor "F" is similar to floor "E," except that the ceiling is arched. This may be used as a restaurant. Floors "G" and "H" will be in the head. These two rooms will be about fifty feet in diameter and about twenty feet high. One may be used as an observatory and contain telescopes on pivots. The elevators are to be run from the base of the structure to the main room on floor "A," in which room will be placed other elevators at convenient points connecting with the floors above. One elevator, however, is to be run from this floor direct to the top floor.

On floors "A," "B," "C," and "D" are to be placed paintings and scenes in miniature of Detroit in its colonial days and anything else pertaining to the city and its growth. The primitive scenes are to be placed on floor "A," each room above showing progress. Floor "D" is to be an art museum, and to contain the Detroit Museum of Art and the relics of antiquities now in the museum at the public library.

The center base will be twenty-five feet high and built in the form of steps. The base is to contain all the necessary machinery, heating and plumbing apparatus. A powerful searchlight, operated by the city electric light plant, will be thrown nightly on the structure while the exposition is open.

Putty for Repairing Broken Stone.

Reduce the following ingredients to powder. Mix all together in a mortar and make into a thick putty with water just before use: Ten parts of clay, four parts of fine iron filings, two parts of peroxide of manganese, one part of common salt (sodic chloride), and one part of borax. The heat will harden this cement. A cement for a similar purpose that will resist a very high temperature is prepared by making into a paste with solution of silicate of potash and borax one part of sulphate of barium and two parts of clay.

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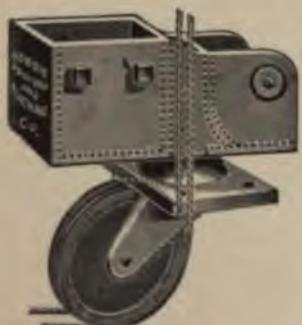
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Book Reviews.

WISCONSIN GEOLOGICAL AND NATURAL HISTORY SURVEY. Bulletins No. 1, 2 and 3. E. A. Birge, Director, Madison, Wis. Published by the State.

The Wisconsin Geological and Natural History Survey was established by act of the Legislature in 1897. It has just begun the publication of bulletins, three of which we have received. The first of these is "On the Forestry Conditions of Northern Wisconsin," by Filibert Roth, special agent, United States Department of Agriculture. The Wisconsin Legislature in 1897 passed an act for the appointment of a State Forestry Commission, charged among other duties, with that of formulating desirable forestry legislation for the State. Dr. Farnow, chief of the United States Division of Forestry, advised that a careful reconnaissance be made of the present conditions of the forests of the State. The Department of Agriculture sent Mr. Roth as an expert to make an examination and the above report is the result of his three months in the field. It is an admirable document in every way and presents all of the facts and figures that are necessary to enable Wisconsin to exercise adequate supervision over her forest wealth.

The second bulletin is on "The Instincts and Habits of the Solitary Wasps," by George W. Peckham and Elizabeth G. Peckham. This excellent monograph is the result of a series of careful observations extending over several years; all made in Wisconsin. The study of the solitary wasps was suggested to the authors by the delightful "Souvenirs Entomologiques" of J. H. Fabre. Although there are more than one thousand species of the solitary wasps in the United States alone, against fifty species of the social genera, the latter are by far the better known. This, as the authors suggest, is due to the fact that the great size to which their communities often attain makes it comparatively easy to study them. The work is written in a delightful style and the literary graces that the authors permit themselves, have not interfered with accuracy of statement.

Bulletin No. 3 is "A Contribution to the Geology of the Pre-Cambrian Igneous Rocks of the Fox River Valley, Wisconsin," by Samuel Weidman, Ph. D., Assistant State Geologist. This admirable monograph is divided into three parts, devoted to "The Utley Metarhyolite," "The Berlin Rhyolite-Gneiss," and "The Waushara Granite." There are quite a number of outcroppings of pre-Cambrian rocks in Wisconsin of both sedimentary and igneous origin. Those of the Fox River district are igneous, of both plutonic and volcanic nature. This is the first study that has been made of them, and it has been done with great care and thoroughness by Dr. Weidman. In these three publications the Wisconsin Survey has made a most auspicious beginning and its work is likely to take high standing among the scientific reports of the various states.

MICHIGAN ENGINEERS' ANNUAL FOR 1889. Edited by F. Hodgman, Climax, Mich. Published for the Society.

This volume of 212 pages contains the proceedings of the Michigan Engineers' Society during the year just closed. It is of particular interest, inasmuch as it presents the papers read at the twentieth annual convention. These are all of a high order, as one might judge from the standing of the Society. Among the papers of special value to readers of STONE is the report on "Street Paving in Michigan," by George M. Ames, William Appleton and E. W. Muenscher, committee on materials for street paving, and on "The Construction of a Stone Masonry Highway Bridge at Hyde Park, N. Y., by Owen Morris, a portion of which is reproduced on another page in this magazine.

ANNUAL REPORT OF THE MINISTER OF MINES FOR THE YEAR 1898. being an Account of Mining Operations for Gold, Coal, etc., in British Columbia, Victoria, B. C. Printed by Richard Wolfenden. Price, 50 cents.

This is made up of statistical tables showing the mineral production of the Province, together with detailed reports upon the various mining divisions. It is the first report of Prof. William Fleet Robinson, the Provincial mineralogist, and is thoroughly creditable to him. There are included full reports from the gold commissioners and mining recorders of the different divisions, in some cases supple-

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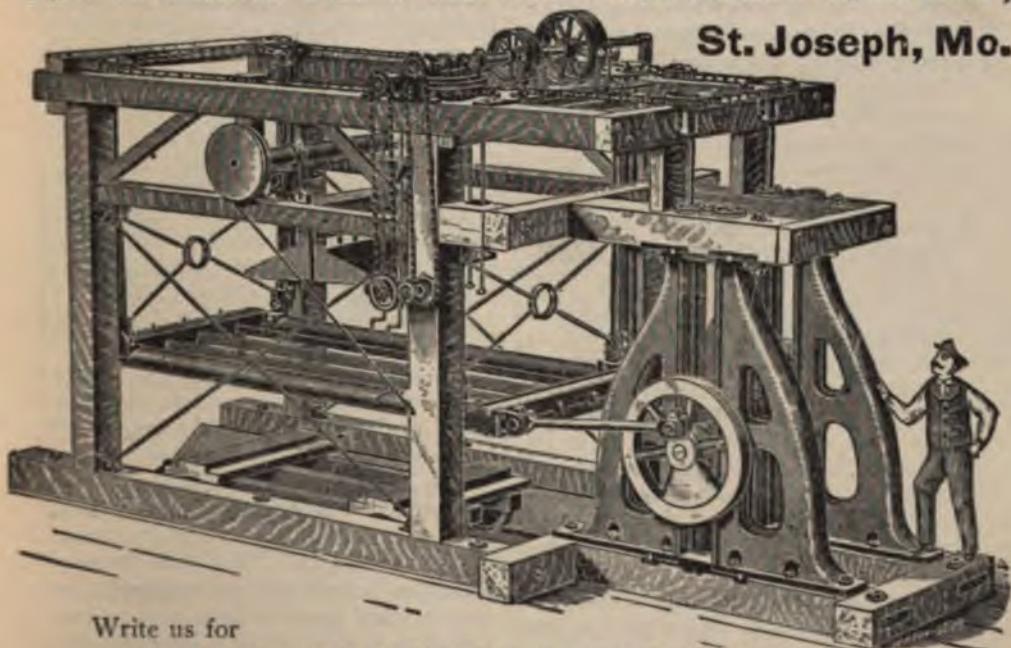
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mented by full particulars from the superintendents of mines. The book is handsomely illustrated and is accompanied by three maps; one a sketch map of the entire province, another giving the southern portion of the Eastern and Western Kootenay districts, and the third giving part of the Cassiar district, showing the Atlin gold fields.

PLASTER CASTS AND HOW THEY ARE MADE. By Frank Forest Frederick. 16mo, cloth, 132 pages; price, \$1.50. New York: William T. Comstock, 23 Warren street, publisher.

The author, who is professor of art and design in the University of Illinois, says that his book is not intended as a manual for professional plaster workers or sculptors, but for the assistance of art students and amateurs. The comprehensive subtitle of the book gives a good idea of the wide ground that is covered. It says: "A plea for a more general appreciation of the artistic qualities and uses of plaster of Paris casts; a brief historical review of the art of casting from the time of the Greeks to the present; directions for making casts by the waste, piece, elastic and sulphur mould processes; casting from life, oiling, painting, cleaning, mending and packing casts and notes upon clay modeling." The directions of the author have been followed by his students in the University of Illinois with excellent results. His suggestions are all simple and to the point, and the book is one that has a great value for all workers in stone.

HENDRICKS' ARCHITECTURAL, ENGINEERING AND MECHANICAL DIRECTORY OF THE UNITED STATES FOR 1899. Cloth, 991 pages. Price, \$5. New York, S. E. Hendricks' Co., 61 Beekman street, publishers.

This book, which has been published annually since 1891, is the only one of its kind in existence. It is a complete and thoroughly classified directory of every branch of architectural, engineering, mechanical and kindred trades and professions of the United States. It contains over 2,000 headings or classifications covering the enormous number of 300,000 names and addresses. The word mechanical has a wide range, but if any one will

examine this book, he will find that the word has not too broad a meaning to cover the various classifications herein included. Every leading manufacture made from cast, malleable or wrought iron, or from steel, brass, bronze, etc., from the raw material to the finished product, is included. The book is of particular value to those in the stone and kindred industries. Not only is it very full in this regard, but also in the lists of manufacturers of quarrying and stone cutting machinery and supplies. The work is invaluable to every progressive business man.

The French Method of Scaffolding

The French method of scaffolding differs in many points from that in use in this country; it is entirely of squared timber, and put together with bolts and nuts, and instead of ladders, regular stairs are constructed in different parts of the scaffold itself. Ready means of ascent and descent are points of more importance in France, from the fact of the substitution, in a great degree, of manual labor for mechanical in raising material to the work. To such an extent is this carried that in the construction of a wall 50 feet in height, which was erected at the request of the British commission, the stones of which it was composed were handed up from man to man by men placed on a ladder and along part of the scaffold, and twenty were constantly so employed.

The World's Two Nickel Deposits

There are but two large deposits of nickel known in the world at the present time. One of these is in Ontario, and the other is in the French colony of New Caledonia, lying in the South Pacific ocean, 7,000 miles from the United States. The mines in New Caledonia produce each year a quantity about equal to that produced in Canada, and are the only possible competitors of the Canadian ore, and as the latter has superseded the French product in the free markets of the world, there is no doubt that it has the preference over its rival. But there is some reason to believe that an agreement has been reached between those now in control of the two great fields by which they divide the market.

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Vol. XIX.

August, 1899.

No. 3

STONE

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ISSUED MONTHLY.

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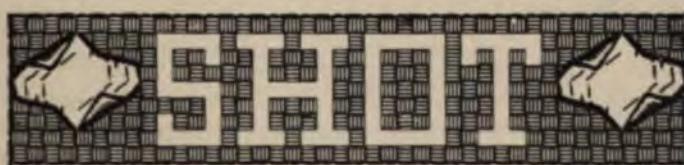
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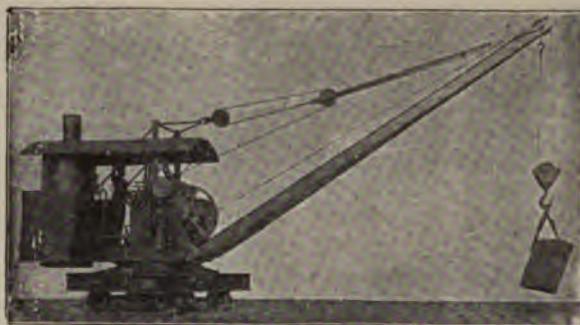
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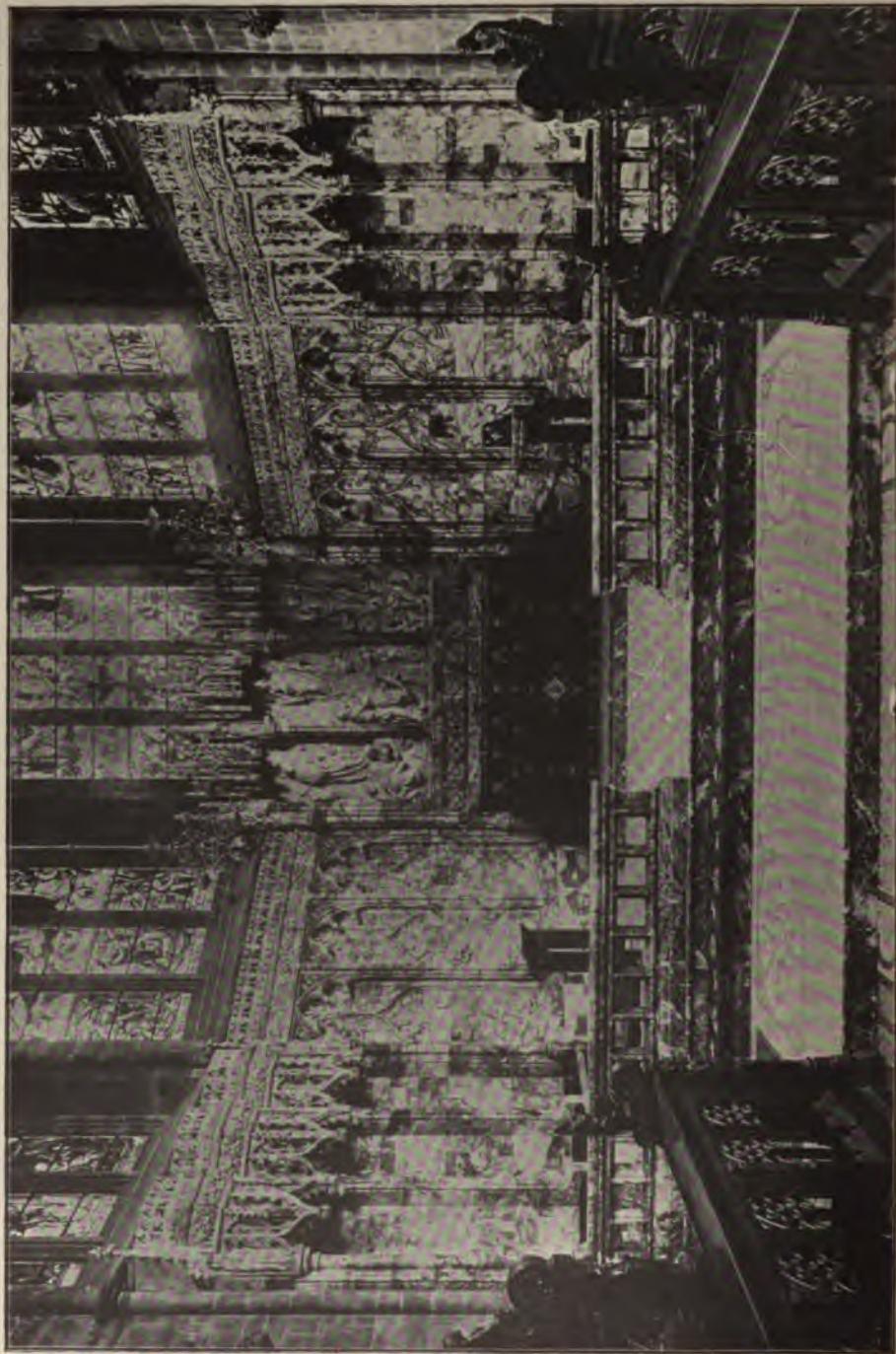
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AN EXAMPLE OF ENGLISH ALABASTER WORK, ASTOR CHURCH, BIRMINGHAM.

See Prof. Merrill's Article



VOL. XIX.

AUGUST.

NUMBER 3.

MODERN WORKING OF THE OLD EUBOEAN MARBLE QUARRIES.

SI N a recent number of STONE there was given a most interesting account, written by W. Brindley, F.G.S., of the rediscovery, after several years of active search, of the famous quarries of Grecian marble on the Island of Eubœa. These quarries produced the celebrated marble that was known as Carystium or Eubœan marble, but is now called by the Italian name of Cipollino, from its onionlike markings. STONE has procured a series of interesting photographs of the quarries, and they are herewith reproduced. They were taken under disadvantages, and one of the most interesting of the lot, showing a huge pile of débris that must have been the result of centuries of rude working, is so stained that it is impossible to engrave it.

In connection with the pictures it is desirable to give a brief summary of Mr. Brindley's account of the location and nature of the quarries. During the search that was made for the old workings many inferior quarries were found, but none of these would repay modern exploitation. Finally a series of old quarries with beds of superior quality were discovered on the west coast of the island, a little north of Carystus. Between the villages of Stura and Kapsala, which lie in a valley, and the sea a range of mountains rises to an altitude of 2,000 feet, running steeply down to the sea. Upon the sea face of one of these mountains, which still bears the ancient name of Pyrgadi, was found a range of ancient quarries, extending from the summit to the base near the sea. The upper range of quarries is very extensive, and was evidently worked by the State, for the supplying of monolithic columns to ancient Rome. This Eubœan stone was the first colored marble used in the Eternal City, and was very extensively employed. Some of the earliest examples are the ten columns to the portico of the Temple of Antinous and Faustina in the Forum, 38 feet long. Eight columns of similar size now remain in the old quarries, evidently worked at the same time, but never used.

Mr. Brindley estimates that probably 80 per cent. of the wall and pier marble incrustations of St. Mark's, Venice, is of this Cipollino. Many of these slabs are supposed to have been obtained from demolished buildings of earlier date, although there is evidence that the Turks knew the quarries and probably brought supplies of the marble from the quarries during the Roman-Byzantine period.

So much Mr. Brindley wrote of the quarries, confining himself strictly to the marble and its working. But it is difficult to pass the wealth of legend and tradition that hangs over the entire neighborhood. The most ancient name of the Island of Eubœa, as Strabo says, was Macris, which it obtained from its great length as compared with its breadth. The name of Eubœa originated traditionally from the passage of Io, who was even said to have given birth to Epaphus, the son of Jupiter, in this island. Its inhabitants were among the earliest navigators of Greece, a circumstance which seems to confirm the notion preserved by Strabo, of its having been occupied, in distant ages, by a Phœnician colony. Its fertility attracted the attention of the Athenians, and they subjugated and colonized it prior to the Peloponnesian war. Carystus, near which the quarries are located, is a sea coast town at the foot of Mount Oche, called at present Hagios Elias. Carystus is now known by the name of Castel-Rosso, and was founded, tradition asserts, by some of the Dryopes, who had been driven from their country by Hercules. Strabo says that the name of the place from which the marble actually came was Marmarium, and that a temple was erected there to Apollo Marmarus. This is only a tradition, but as a matter of fact, there has been found on this very



THE OLD CIPOLLINO QUARRY.



QUARRY SHOWING OLD WALLS, EIGHTY FEET HIGH.

mountain of Oche the remains of an old stone building. At a considerable height there is a narrow plateau, to which there is only one access, and over which the rock rises still a little higher. On this plateau modern travelers (first Hawkins) have discovered a stone house, from which there is a splendid view over the sea and island. According to the measurement of Ulrich, it forms an oblong from west to east of 40 feet in outer length by 24 in width. The walls, 4 feet deep and formed of irregular pieces of slate, rise to 7 feet in the interior. In the southern wall there is a gate covered with a slab 13 feet long by 1½ feet thick, and two small windows which remind one of the gates in the old Cyclopic or Pelasgic walls. The roof of this house consists of hewn stone slabs, which, resting on the thickness of the wall, are pushed one over the other towards the inside—a mode of covering which has also been used in the buildings of the earliest period of Greek architecture, as, for instance, in the treasure houses of the old royal palaces. E. Guhl and W. Koner, the German archaeologists, believe that this building is a temple, despite the objections of other learned men. They repeat the myth of the celebration of the nuptials of Io and Jupiter on this island and say: "We may assume, almost with certainty, that the described temple was erected in commemoration of that mythical event, on the very spot where it is said to have taken place." Mr. Brindley in his article in STONE says: "One quarry contains the old smithy, with a beveled trough all furrowed and worn by the tempering of tools; while another trough of large dimensions lies alongside, into which they were thrown to cool after being tempered." The



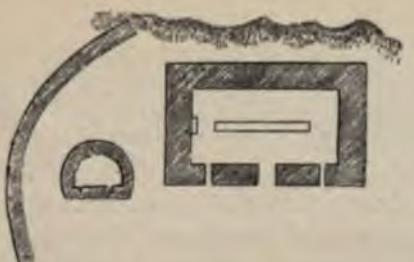
BLOCK PARTLY WROUGHT ON UNDER SIDE FOR TWO COLUMNS.

question now arises: Is this old stone building Strabo's temple of Apollo Marmarus; Guhl and Koner's wedding temple of Jupiter, or Mr. Brindley's prosaic smithy? The views of the building that we present are from Guhl and Koner, and we cannot tell whether this is the same structure that Mr. Brindley describes.

The quarry views that we present give an excellent idea of the massive ledges that still remain to be worked. In the middle foreground of one of the pictures will be seen a shaft of marble lying just as it was left by the workmen of the old days. On the underside, it will be seen, it has been roughly worked into double columns. All of the columns were thus roughed out while the block was still attached to the quarry bed. It was then



TEMPLE OR SMITHY?



INTERIOR AND PLAN OF OLD STONE BUILDING.

wedged off and finished. Numerous other examples of work in progress are still *in situ*.

As stated above, these quarries are now being reworked, and a number of shipments of beautiful quality have arrived in London. The quarries will readily produce monoliths 26 feet long. In London the Cipollino marble is being employed for the columns and walls of the new Cathedral at Westminster, and for the new hall and staircase of the Drapers' Company. It has been selected by the council of the Royal Academy for their new entrance hall, and by the city architect for new pedestals for the Guildhall of the City of London. It will decorate the interior of a fine mansion at Tunbridge Wells, the façade of Parr's new bank at Liverpool, and a large number of domestic works. Cipollino will also be used for pedestals for the Sculpture Gallery of the British Museum.

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Bros., of Allegheny, Pa., together with the Forest City Stone Co., are proud of their work, and well they may be.

The Forest City Stone Co. have gone to the front rank in the production of an exceptionally fine grade of sandstone of late years, and are to be congratulated. They are just now completing the orders for the Washington County Court House, which is one of the most beautiful and extensive buildings of the kind in the country, reflecting credit upon the architect, contractors and material men as well.



THE AMERICAN UNIVERSITY'S HALL OF HISTORY.

MUCH that is best in American architecture is to be found among the various institutions of learning, from one extreme of the country to the other. The large endowments of many of the colleges and universities have enabled them to have rich and appropriate housing and surroundings, and their constant growth calls for many new buildings. This wealth of equipment and accommodation can well replace the hoary antiquity and cloistral repose that lend such a charm to the universities of the Old World. STONE presents this month an admirable example of the modern college building. This is the Hall of History of the American University, recently erected at Washington, an engraving of which accompanies this article. It has a sightly location and the architects have made the most of their opportunities. The building has a dignity and classical simplicity in perfect keeping for the purpose for which it is intended. The material from which it is constructed gives it a richness and beauty impossible to indicate in any illustration. The Hall of History is constructed of Vermont marble, furnished by the Columbian Marble Quarrying Company, of Rutland, and the building is acknowledged by architects and experts to be one of the finest examples of marble work in the country.

The preliminary plans for the building were made by Messrs. Van Brunt & Howe, of Kansas City. These plans were finished by Mr. William M.

Poindexter, of Washington, D. C., associate architect, who was finally given full charge of the building, Messrs. Van Brunt & Howe withdrawing. The work is highly creditable to those who gave it inception, as well as to the architect who brought it to completion.

The Columbian marble was put to a thorough test before it was accepted for this important structure, and samples taken at random from the quarry were sent to Yale and Harvard for analysis. The experts from these institutions report this marble to contain from 96 per cent. to 98 per cent. of carbonate of lime, and state that it is equal to most of the granite in its crushing strength. There is no marble produced in the United States that is superior for building purposes, its texture being close and the absorption infinitesimal. It was upon this high test that the contract was awarded to the Columbian Marble Quarrying Company, and the execution of the work, and the rapidity with which it was completed, commend the company to the consideration of architects contemplating the use of marble.

The finished building is a credit to the American University and a decided acquisition to the public edifices of Washington.

A NEW DECORATIVE STONE—VERDOLITE.



URING the past month Mr. William B. Reed, president and general manager of the Verdolite Co., of Easton, Pa., has been in this city introducing to the leading architects and builders the remarkable marbles produced by his company.

About two miles north of the city of Easton, Pa., a mountain rises to an abrupt summit of more than 500 feet above the Delaware River. From the earliest times it has been known as "The Weygadt." It is the central figure of a district which for many years has been a most inviting field to the geologist. Since the publication of the first report of the Pennsylvania State Geological Survey, much has been said and written to account for the peculiarly complicated geological structure of this region, and also for the occurrence of many rare eruptive and profoundly altered sedimentary rocks. These rocks are confined principally by the walls of a most clearly defined fissure or "fault," which extends for some distance along the southeastern slope of the Weygadt Mountain, and which doubtlessly had its origin at an early period of the world's history, when the masses forming the great Appalachian chain of mountains were folded up. About the central point of this "fault" is found a deposit of rock and minerals which presents a problem for which the geologist has yet found no solution. This deposit includes many varieties of serpentine; also augite, syenite, tremolite, hornblende, jasper, opal, ophicalcite, zircon, molybdenite, asbestos, titanite, graphite, mica and many other substances of equal interest to the student of nature. In the midst of this peculiar formation there have been recently discovered large masses of a rock which has never been described in geological text books. It has been called "Verdolite,"

to express a mixture of "Verde Antique" and "Rose Dolomite," as these constitute its principal component parts.

Verde Antique, the green marble of Greece, is one of the most famous of decorative stones, and many of the magnificent buildings of ancient architecture made use of it. The pure Rose Dolomite is so rare that it is found only among cabinet specimens. Therefore, this present Verdalite is a freak of nature and is absolutely unique. It contains the rich mossy greens of the Verde Antique, while scattered through it are the delicate pinks of the Rose Dolomite. The peculiar colored combination is caused by the salts of manganese and peroxide of iron which by infiltration permeated the rocks in a primitive state. The colors are blended in all of different shades, harmonizing perfectly and forming an endless variety.

The Verdalite Company also has immense ledges of pure Royal "Serpentine, which has heretofore been one of the most expensive of decorative stones. There are also deposits of "Victoria" Serpentine, which is distinguished from the "Royal" by tracings of pure white asbestos, forming a most beautiful contrast to the dark greens. There are also immense ledges of Tremolite of the purest quality. This stone is harder than granite, is pearl white in color but tinged in places with delicate shades of green and pink.

The Verdalite Company owns the entire tract in which these magnificent deposits occur, and is equipping its quarries with modern machinery for the rapid development of the property. Many tons of the stone have already been taken out, and there is one block of the Verdalite recently gotten out, and now awaiting working, that weighs over 160 tons. Thus it will be seen that it will be possible to obtain columns of large size from this beautiful and unique material. The company has wisely decided to limit the use of the material solely to interior decoration of the highest character.

AN ENGLISH VIEW OF AMERICAN STREET PAVING.



NE of the English writers who has traveled about considerably in this country, contributes the following article to "The Illustrated Carpenter and Builder," of London:

In the year 1895 New York had the unenviable reputation of being the worst paved city in the world; but General Collis, who introduced asphalt paving, brought about a marvelous improvement at a comparatively small cost. By means of asphalt Fifth avenue has been transformed into a delightfully smooth and noiseless thoroughfare, and Park avenue—useless for a quarter of a century as a means of vehicular traffic—has been converted into a useful and pleasant roadway. In England the municipality repairs the footways, but in New York owners of property have to do it themselves, the municipal authorities merely calling upon them to effect the needful repairs. This procedure often leads to delay and evasion, the footway, meanwhile, remaining unrepaired. The system is also tolerably general in other cities, with

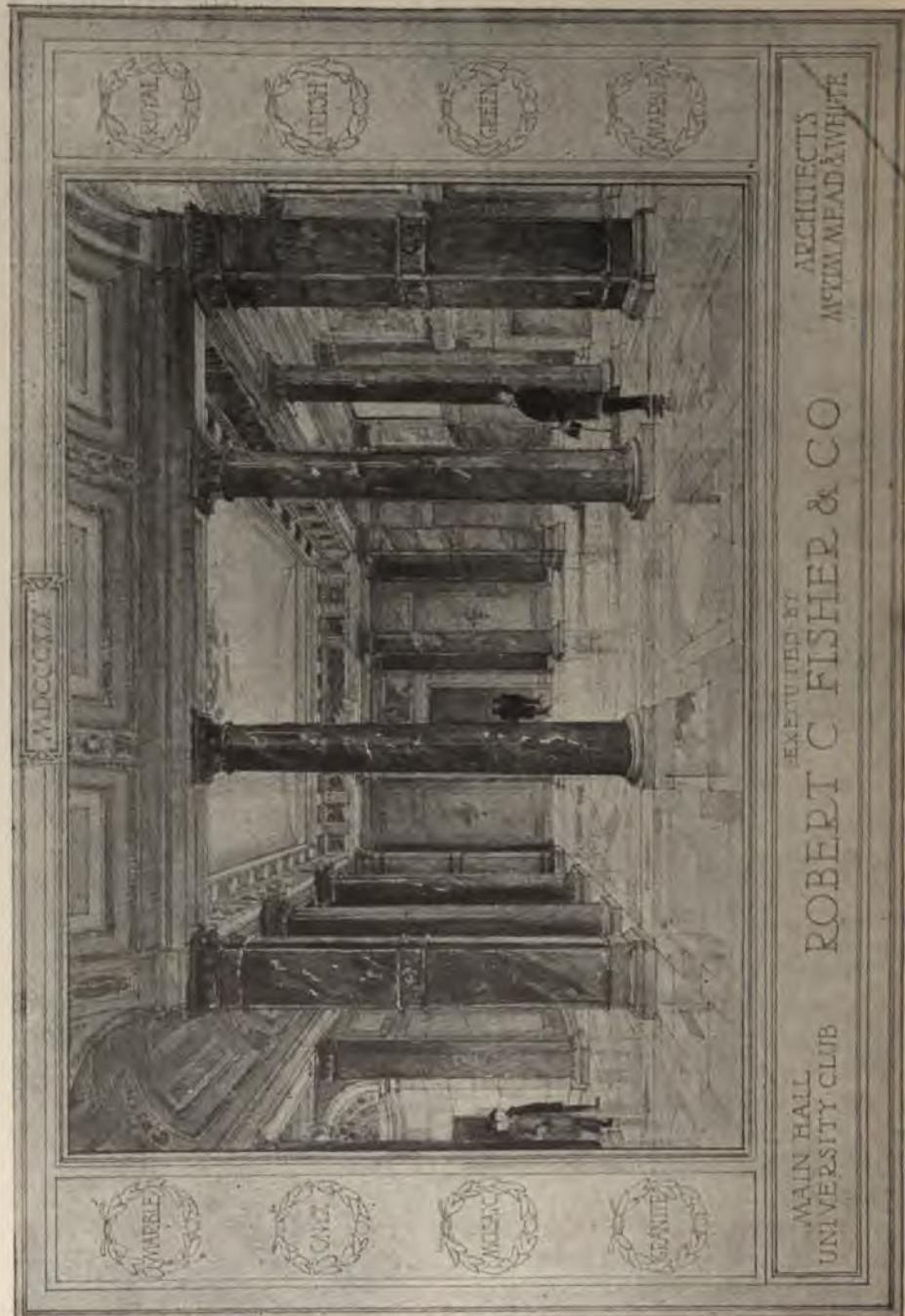
the exception of Washington, where the householder defrays one-half the cost of repair and the municipality the other. In spite of what was done by General Collis to improve New York in connection with paving, street lighting and sanitary matters, much still remains to be done. His exertions were confined chiefly to the residential part of the city and to the outskirts. Wherever the new pavements were laid they are undoubtedly excellent, but many of the busy thoroughfares are in a shocking condition. In New York, Baltimore and Philadelphia the author saw many important residential streets and business thoroughfares in which neither roadway nor footway had been repaired for years. The fact that many of the streets are composed of worn cobble stones may possibly explain to some extent the American distaste for walking. All the more recent paving work is put down under contract, and maintained free of expense for five years by the contractor. Subsequently they are maintained by the municipality, usually in a slipshod way. Incidentally it may be mentioned that street refuges are unknown, and, naturally, crossing at the intersections of the busiest thoroughfares is no easy matter. In the suburbs of New York and other cities, when land changes hands for building purposes, the roads are at once laid out, paved and sewered by the city authorities, at the expense of the abutting property owners. The object of this prompt action is to improve the property and prevent it from lying idle for any length of time, as the owner is rated for the land whether he builds upon it or not. It must be remembered, of course, that land in America is mostly freehold. In regard to paving materials, the first thing noticed is the singular coincidence that, though wood paving was introduced into this country from America, and has been so largely used here, not only in London but in provincial cities and towns, not a single yard of this form of pavement is now to be found in any cities the writer visited in the United States. The pavement of to-day and of the future in America is undoubtedly asphalt in one of the two forms—either sheet asphalt, similar as regards surface to what we in this country know as asphalt, or asphalt blocks, both being composed for the most part of Trinidad asphalt. It is claimed for both these forms of asphalt pavement that they offer the maximum amount of safe foothold for horses. No doubt smoothness of surface, with safety of traffic, are the features which chiefly commend them. The city of Washington—the seat of Government and largely residential—possesses fine wide streets, and has the reputation of being the best paved city in the United States. Here, as in most American cities, the paving consists of granite blocks, stone cobbles, sheet asphalt and asphalt blocks. Wherever the two are found the streets are in a very bad condition. The footways are generally in keeping with the roadways, for they are composed of almost every conceivable kind of material—stone, concrete, brick or asphalt—according to the fancy of the property owner, who is supposed to keep them in repair, except in case of complete renewal. In the latter case the city shares the cost with the owner. Fortunately the great majority of the carriage ways in Washington are paved with sheet asphalt and asphalt blocks. There are, in fact, three hundred miles of the former pavement and two hundred of the latter. This pavement is now being extensively used in New York, Baltimore, Washington and many other cities. Samples of both the sheet and the block asphalt have been laid in London and Paris, but under no circumstances

has the author seen either of these pavements laid in any city in America under such conditions of traffic as those to which the busy London thoroughfares are subject. He can safely say that every surveyor and every local authority in this country would welcome any pavement that could be relied upon to be non-slippery, durable, and which had a smooth surface. At the same time it should be remembered that climatic conditions constitute important factors in connection with the different forms of paving and their respective degrees of cleanliness. While speaking of Washington, it may be mentioned that there, as in New York, the electric tramcar is the chief means of locomotion, lines being laid even in the most fashionable thoroughfares. In another respect also, besides that of locomotion, American cities have a distinct advantage over our own. Generally speaking, they are better lighted—of course, entirely by electricity. All things considered, the cost is rather less than with us. If the author has any adverse criticism to make in connection with the method of lighting, it is that the clear globe in use in America is a mistake, as it tends to make the light of an unpleasantly glaring nature.

CONNEMARA MARBLE AT THE UNIVERSITY CLUB.

ONE of the most striking jobs of marble work recently done in this city is to be seen in the magnificent new home of the University Club on Fifth Ave. The main entrance on Fifty-fourth St. is dignified and massive, flanked by huge columns. One enters through the vestibule into the spacious main hall, which is particularly rich and beautiful in its effect. The vaulted ceiling that surrounds the sides of this hall are supported by columns of green Connemara marble, while pilasters of the same material flank the doors in the side walls, and the huge chimney piece opposite the main entrance. The marble was furnished and erected by Robert C. Fisher & Co., of this city. The accompanying illustration will give an idea of the general style, but nothing in the way of printers' ink can convey an impression of the rich colored effect of the Irish marble. There are eight round columns, each a monolith measuring 15 feet by 2 feet and 3 inches. There are four corner pilasters of the same dimensions and four wall pilasters 15 feet by 2 feet 3 inches and 6 inches in thickness. The bases are of white Vermont marble, while the caps are of bronze, gilded. This furnishes an admirable contrast. The marble is richly variegated, running from Royal Serpentine through all the tints of gray-green and yellow-green. Indeed there are some tints of gray that have a distinct suggestion of lavender and dove color. The marble bears evidence of some violent convulsion of nature, for the strata are crumbled up with an exquisite wavy effect.

Connemara green marble is quarried on Lissoughter Mountain at Recess, thirty-five miles west of Galway, in Ireland. This quarry has been in existence for a century or more, but the marble has not been brought into prominence until the building of a railroad from Galway to the West coast



MAIN HALL
UNIVERSITY CLUB

EXEQUED BY
ROBERT C. FISHER & CO

ARCHITECTS
WM. MEAD & WHITE

some four years ago. Prior to that there were no means of getting the marble either to the railroad or tide water in blocks of any magnitude.

The marble is a true deposit of the Serpentine variety, and has been used in England and the British Isles in some of the most notable buildings.

The firm of R. C. Fisher & Co. obtained a lease of this quarry some four years ago, and since that time they have introduced it in the United States. Some of the large work in which it has been employed is notably Columbia College Library Building, University Club, and New York University Library Building, in New York City.

A CONSIDERATION OF SOME LITTLE KNOWN AMERICAN ORNAMENTAL STONES.*

IT is now, I think, very generally conceded that the great development of art among certain ancient peoples was due to the ready availability of such materials as lent themselves most readily to art and architectural expression. Otherwise stated, the kind of art which developed most favorably in any region was controlled by the character of available material. It is impossible, for instance, to conceive of the wonderful development of sculpture characteristic of the early Greeks and Romans as having developed in a region so lacking in inspiration and so barren of materials as is the Mississippi Valley of our own country. This is especially true among those forms of art which find their best expression in stone, since the great weight of the materials rendered its transportation in the early days a matter of practical impossibility, excepting in regions favorable to trans-shipment by water. Since the invention of the steam car this last named difficulty has been largely overcome, and it is scarcely too much to say that to-day the earth is ransacked throughout almost its entire length and breadth for material, not merely for the smaller works of art but as well for the larger and grander forms of architecture. In ages past, difficulties in the way of transportation and hardness of material were in part overcome by the cheapness of skilled labor. The high prices now put upon skilled labor and enforced by labor unions, have in our own country very largely counteracted the cheapening of methods of transportation through the introduction of steam power. Indeed, owing to the cheapness of foreign labor, as compared with the United States, the Italian materials will to-day compete on equal terms in our Eastern markets with those of the United States; and were it not that modern ingenuity has called into play a score of devices whereby the labor of one man is multiplied many fold, it would be impossible for any but the very wealthiest of our people to indulge their taste in any but the most commonplace of art objects made from domestic materials so obdurate as stone.

Among none of the nations of the world is stone to-day so universally used for general structural purposes as in America. No one can but be surprised, and I think agreeably surprised, in comparing the structures—private

Read before the Annual Convention A. I. A., Washington, D. C., by George P. Merrill, Head Curator, Department of Geology, U. S. National Museum.

residences and business blocks, municipal and Government buildings—of this country with those of foreign nations. There is a richness and appearance of solidity (sometimes it is true quite delusive) and a variety, among the buildings of American cities which stand in strong and pleasing contrast with the weather-marked and otherwise shabby stucco structures of the Eastern Continent.

Gifted with a variety of materials such as has fallen to the lot of no other nation, and with multiplicity of railroads and waterways, we are enabled to transport these materials throughout the entire length and breadth of our continent at rates which would have seemed incredible even a half century ago.

The rapid development of art and architectural instinct which has taken place during the last quarter of a century in this country has been gratified very largely through an importation of materials from the Old World. For many years this condition of affairs must continue to exist; in fact, so far as relates to certain forms of art, must always exist. We have, however, within the limits of the United States (and you will remember that I am speaking now wholly with reference to stone) many varieties of materials which are fully equal, if not superior, to those which are brought from abroad, and which, whether equal or superior, are in many cases so entirely different as to merit attention for this reason alone. Many of these materials have been known for years, but the great cost of working, together with the limited demand, has prevented their being seriously considered. It is with these thoughts in my mind, which I fear I have somewhat crudely set forth, that I have prepared the paper which bears the title "A Consideration of Some Little Known American Ornamental Stones." Inasmuch as ocular demonstration in such cases is vastly superior to any amount of detailed oral description, I have brought from our national collection a series of some of the more striking specimens, and will now proceed to call them to your attention. I may say at the outset that scarcely one of these stones is to be found at present upon the market. This for the reason that there has as yet been no such demand as would make their working profitable. That there is no such demand, I believe now to be due to the fact that the public do not realize their possibilities.

Among the stones of greatest interest from a historical standpoint is the so-called Oriental Alabaster; a carbonate of lime found in the rifts and caves of the Eocene limestone of the Nile Valley. This is comparable every way with the cave deposits of our Eastern United States. The general character of this stone is well represented in the specimen I hold in my hand. Its color, translucency and banding is comparable to the translucency and banding of the nail on the human hand. This feature has given it the name of the onyx, from the Latin oniscus, a nail. The same name is applied to calcarous rocks of quite similar nature but a product of hot springs action, such as are familiar to you under the name of Mexican onyx. This stone, owing to the characteristics I have mentioned, was a great favorite among the Egyptians and was used for the manufacture of amphoræ, urns and various domestic utensils, as well as for interior decoration, even as far back as two thousand years before the Christian era. A stone in every way similar was used by the

Greeks and Romans, and is still utilized by the people of to-day both for interior decoration and the similar works of art. As I have already stated, material of this nature is abundant throughout the limestone caverns of the United States. Thus far all attempts to utilize it upon a commercial scale have proved unsatisfactory. This is due, as I believe, wholly to an erroneous idea as to the character of the material and a lack of appreciation of its possibilities. The rock is almost universally removed from its bed by blasting, whereby it becomes more or less shattered; is then taken to the stone-yards to be cut up into slabs as a log is sawn into boards. The material is then polished with the expectation that it will be used for sheathing and the tops of furniture. I need scarcely say that the results are invariably unsatisfactory. Walls thus sheathed are anything but beautiful, and moreover the stone is of such nature that surfaces of large size, free from flaws, are very rarely obtainable. The stone needs first to be removed from the bed with the greatest care to prevent the development of incipient fractures, and when so removed, each block needs to be considered by itself with reference to its adaptability for a turned column, vase or polished slab, or to whatever use it may be best suited. The block before you will suggest at once the possibilities in these various directions. One other item I may add which has prevented the successful introduction of this stone into our market, is the fact that the quarrier fails to realize the uncertain and irregular character of the product, and unscrupulous promoters have insisted upon the floating of more stock than it is possible for such property to bear. It is at best a minor industry and one which must be carried on as much for love as in the hope of pecuniary gain.

Of the same nature as this—excepting as I have stated that it is a product of hot spring action, and further that it is impregnated with a considerable percentage of metallic oxides which give it more intense colors—are the so-called onyx marbles of our Western States and Mexico. These, of a green, reddish and yellowish color, are so well known to you that I will not dwell upon them in detail. I wish only to call your attention to their translucency when in thin sections and to suggest the possibility of their use in place of highly colored glass in windows. In times past, stones of this nature have been put to this use and may to-day be seen in some of the foreign cathedrals. I will also call your attention to a slab of oxidized material. This I selected from the dump where it was thrown by the quarriers who assured me that it was no onyx and that it was worthless. I will leave its value for you to decide, feeling sure that you will agree with me. It is simply the ordinary green onyx in which the percolating waters have so far oxidized the ferrous carbonate as to render the stone opaque and change the colors from green to various shades of red and brown. I have called this variety tapestry onyx on account of its fancied resemblance to ancient tapestry.

Another stone which was a favorite with the ancient Egyptians and with the Romans as well, was the so-called antique porphyry, rosso antico, a small sample of which I hold in my hand. You will perceive that it consists of a dense reddish base thickly studded with small pinkish crystals of feldspar. The stone is of very uniform grain and I need scarcely say of beautiful color. Since the days of the Romans there have been, so far as I am aware, no

attempts to work it on a commercial basis, though some large blocks of stone were exhibited by an English company at the World's Fair in Chicago in 1893. I have to show you now a small sample of a stone quite similar in nature, from one of our Western States, which was selected from a collection brought in by a member of the United States Geological Survey. This particular stone is probably to-day practically inaccessible, but I have others here of a very similar nature which I feel confident can be had in any desirable quantity should there be any demand for the same. I would call particular attention to the beautiful porphyry breccia from the Franconia region in New Hampshire, a deep, dense, dull red variety, variegated with spots of a brighter hue and sometimes crystalline particles of feldspar. Hard, and almost as indestructible as glass, it is equally well adapted for exterior and interior work, and it is difficult to conceive of a more beautiful stone for turned columns or polished pilasters.

Of somewhat the general nature, but differing slightly in color and in texture, are these samples from the old lava flows in Eastern Massachusetts. Varying from brilliant red through brown and various shades of gray to nearly black, sometimes mottled with yellow; finely and evenly porphyritic, and sometimes brecciated, they give a variety of color and structural features which can leave little to be desired. I feel that I cannot say too much in praise of this material. No two samples are exactly alike, and however much the stone may be used, it can never become commonplace or vulgar, and with proper selection it will be possible to make such objects as the owner may be sure can never be exactly duplicated. I will pass these samples around for inspection, and at the same time will show a nearly black white spotted rock of the same nature from Fond du Lac County in Wisconsin, and a white black spotted variety from near Charlotte, N. C.

Another igneous rock also used by the ancient Romans was the so-called marmor Lacedæmonian viride or green antique porphyry, a parphyritic diorite from Southern Greece. So far as I am aware the exact equivalent of this stone has never been found in America, but I submit herewith a pebble picked up in the drift of Eastern Massachusetts which will convey to you some idea of what we may expect to find when systematic search shall be made.

In the Church of Our Saviour in Moscow, the interior walls are sheathed to a height of perhaps four feet, with a deep, dark gray, almost black, babbro-like rock, variegated with most beautiful purplish iridescent spot. Above this, to the height of six feet, the walls are sheathed with a chocolate red quartzite. The rock is so dense and close that its exact mineral nature could be made out only with difficulty, but the effect, to my eye at least, was superb; and with this in mind I bring to your attention a block of quite similar quartzite from deposits near Courtland, in Nicollet County, Minn. It certainly merits a better use than that of the manufacture of paving stones, to which it is now exclusively applied.

While engaged in survey work in Montana some years ago my attention was directed to some peculiar jointed blocks of what appeared to be indurated volcanic mud, in which the action of the weather had produced a most unique and interesting banding. I brought with me some of the blocks to Washington, and on cutting them found them of such beauty that I endeavored to

induce a stone dealer in New York to interest himself in them sufficiently to put the material upon the market. The attempt failed, but not I believe because the stone was lacking in beauty or adaptability for some forms of work. I show you here a few selected samples; others may be found in the national collections. As I have stated, the rock is evidently an indurated volcanic mud. In this connection, I might well call your attention to another indurated mud or clay from Pipestone County in Minnesota. This is the so-called catlinite, formerly used by the Sioux Indians for the manufacture of ceremonial pipes, but now utilized for the manufacture of pipes and various small ornaments for sale to the tourists. It is to be had in slabs of only very moderate dimensions, but its color is such as seems to me to render it worthy of more serious consideration than it has yet received.

The two samples of marble from Burnet and Austin, Texas., shown here in the form of four-inch cubes, are in color or veination quite unlike anything now upon our markets, and though probably somewhat difficult to work, present many desirable qualities.

The so-called verde-antique marbles, such as are familiar to you all and so frequently used for interior decoration, are abundant in various parts of the United States, but the cost of working is such that the present supply is brought almost wholly from Italy. I will not detain you by going into a detailed description of these rocks, merely calling your attention to a few thin slices of the purer varieties of these stones which I have prepared in order to show their translucency and suggest their utilization for other purposes than that of polished slabs and turned columns. The slab in my hand I picked from the dump piles of the old chrome iron mines near the State line between Pennsylvania and Maryland. During the time that these mines were in operation many tons of this material were thrown out in the form of small irregular blocks. It was of interest to mineralogists and was widely scattered in the form of small specimens throughout the cabinets of the world. So far as I am aware, no attempt has been made to put it to any practical use. When in thick masses it is not a stone of extraordinary beauty, but when cut sufficiently thin to allow the light to pass through, I think you will acknowledge it is worthy of your consideration. Two other samples of material of the same nature, but varying in color and of very different size, are submitted for your inspection.

There remain but two rocks to which I will call attention at the present time. The first of these is a granite rock from Madison County, Va. I have never seen this rock in place, but from its character I judge it can be had only in blocks of very moderate dimensions. Its colors, a light green ground mass, interspersed with light pink feldspars, are such as to make it of interest and perhaps of use.

The next sample is a slab of very common type of rock, such as is thrown to the dump by the hundreds of tons in many of our mica and feldspar mines. It is what is commonly known as pegmatite, a graphic granite. It is a well-known rock and found in all our mineralogical and geological collections, and has occasionally been utilized in the manufacture of small objects of art. In plain surfaces it works as readily and safely as ordinary granite, and I can but think it might be utilized to advantage in many forms of interior decoration.

Two samples of rose quartz, the one from Maine and the other from Connecticut, are also worthy of attention. At present such are used only in the manufacture of abrasives and of paints or as an adulterant in soaps. The tints, unfortunately, are not lasting when exposed to the weather, but are sufficiently permanent for interior work.

It may be asked what good I can expect to accomplish in calling attention to materials which are not upon the market and for which there can in some instances be no regular and constant source of supply. My reply is that while in certain lines of business, materials have been put upon the market and a demand created, I am satisfied that in the present case the demand must come first. So soon as it is apparent that there is anything like a satisfactory demand I feel sure that quarriers and dealers will find means of meeting same. It may be chimerical, but I hope to see the time when it will be possible to find in the hands of dealers a varied assortment of these rarer and now little used materials, which may be inspected in the rough by the architect, artist and artisan, and devoted to such ends as the inherent qualities of each piece may render it best suited. It is at least a consummation devoutly to be wished.

THE GREATEST YEAR FOR MINERAL PRODUCTION



HE editors of that invaluable annual, "The Mineral Industry; Its Statistics, Technology and Trade," have compiled the figures and tables of the mineral production of the United States in 1898, which are to be incorporated in the seventh annual volume.

These statistics are a monument to the labor, care and painstaking accuracy of the editors. They are the most comprehensive figures of the kind that have ever been published. The mineral and metal production of the United States in 1898 was the largest in the history of this or any other country, and is an exhibit worthy of the attention of economists and lawmakers. The economic details published in "The Mineral Industry" volume shows that the United States is rapidly attaining the point where it will be the greatest exporter of minerals and metals of all the commercial nations.

With the permission of the publishers of the volume (The Scientific Publishing Co., New York), we reprint such of the reports as deal with the subjects to which STONE is devoted:

Asbestos.—The domestic production was 885 short tons (\$13,425) in 1898, against 840 short tons (\$12,950) in 1897. In each year the production was made almost entirely in one mine in Georgia.

Asphaltum and Asphaltum Products.—The production of asphaltum, liquid and solid, in 1898, was 25,690 short tons (\$482,175), against 27,397 (\$486,620) in 1897, the entire output each year having been made in California. California and Kentucky, chiefly the former, produced 49,536 short tons (\$146,275) of bituminous rock in 1898, against 47,470 (\$136,173) in 1897. Utah and the Indian Territory produced 14,099 short tons (\$70,495) of asphaltic limestone, against 2,390 (\$11,450) in 1897. The output of Utah

decreased in 1898 and that of the Indian Territory increased immensely. The production of grahamite or gilsonite in 1898 was 2,675 short tons, against 1,756 in 1897, the product each year being valued nominally at \$30 per ton at the mines. Colorado produced 115 tons in 1898, the remainder being derived from Utah.

Carborundum.—The production reported by the sole producer was 1,594,152 pounds (\$151,444) in 1898, against 1,242,929 (\$153,812) in 1897. The decline in value was due to the increased proportion of the cheaper grades marketed.

Cement.—The total production of Portland cement in 1898 was 3,584,586 barrels of 400 pounds, valued at \$6,168,106, against 2,430,903 (\$3,724,905) in 1897. The largest part of the increase was due to the Lehigh district of Pennsylvania and New Jersey, but New York, Ohio and other States also showed important gains. There was remarkable prosperity in this industry on account of the increased demand and higher prices. The production of natural rock cement in 1898 was 8,161,078 barrels, of 300 pounds, valued at \$3,819,995, against 7,890,573 (\$3,976,050) in 1897. The increase in the production of natural rock cement was due chiefly to the Indiana-Kentucky district, where the remarkably low prices brought about by excessive competition among the producers undoubtedly stimulated consumption. Many other parts of the United States showed a falling off, owing to the growing tendency to substitute Portland cement for natural rock. The production of slag cement in 1898 was 157,662 barrels of 400 pounds, valued at \$235,721, against 40,000 barrels (\$60,000) in 1897.

Clay.—The value of brick and other clay products made in the United States in 1898 was \$58,470,543, against \$56,487,527 in the previous year.

Corundum and Emery.—The production of corundum in 1898, all of it from North Carolina and Georgia, was 786 short tons (\$63,630), against 293 (\$19,810) in 1897. The production of emery, most of it from Massachusetts, was 2,956 short tons (\$143,800), against 1,900 (\$92,000) in 1897. The resources of the United States in both corundum and emery of the highest quality are large and an increasing production is to be looked for. The production of steel emery or crushed steel in 1898 was 660,000 pounds (\$46,200), against 647,800 (\$51,824) in 1897, the entire make each year being supplied by the Pittsburg Crushed Steel Company.

Feldspar.—The production in 1898 was 21,350 long tons (\$107,147), against 21,901 (\$111,392) in 1897, Pennsylvania being the chief producer each year.

Fluorspar.—The production in 1898 was 12,145 short tons (\$86,985), against 4,739 (\$36,264) in 1897, Illinois and Kentucky furnishing the entire output.

Fuller's Earth.—The output in 1898 was 15,553 short tons (\$87,365), against 17,195 (\$92,398). The most part each year was dug in the vicinity of Quincy, Fla. The new deposits near Ocala, Fla., did not become productive.

Garnet.—The production in 1898 was 2,882 short tons (\$82,930), against 2,261 (\$66,353) in 1897, the output each year being furnished by New York,

Pennsylvania and Connecticut. The domestic resources of this mineral are large, but the demand for it is limited.

Graphite.—The production of crystalline graphite in 1898 was 1,647,679 pounds (\$148,291), against 993,138 (\$44,691) in 1897. The proportionately large increase in value was due to the increased demand for crucibles for the manufacture of projectiles during the Spanish war. The larger part of the product in 1898 was obtained from Ticonderoga, N. Y., but a considerable quantity was mined in Pennsylvania, where some of the old mines were reopened. The production of amorphous graphite in 1898 was 1,200 tons (\$11,-400), these figures being unchanged from the previous year. One company produced 185,647 pounds (\$11,603) of artificial graphite, against 163,382 (\$10,149) in 1897.

Gypsum.—The production increased from 300,369 short tons in 1897 to 348,686 in 1898. These figures represent the amount of crude rock quarried. The most part of the production is marketed as stucco or plaster of paris.

Limestone for Iron Flux.—Iron smelters consumed 5,275,819 long tons in 1898, against 4,247,688 in 1897, the increase being caused by the greater make of pig iron.

Lithographic Stone.—Utah produced 112 short tons in 1898, this substance being reported for the first time in the United States.

Mica.—The production of sheet mica in 1898 was 109,968 pounds (\$91,-432), against 118,852 in 1897. The production of scrap mica was 3,529 short tons (\$39,837) against 2,882 (\$28,820), the values of scrap mica being reckoned for the product before grinding. Practically the entire production of mica is made in New Hampshire and North Carolina.

Mineral Wool.—The production in 1898 was 6,560 short tons (\$70,314), against 5,617 (\$61,494) in 1897. A part of this product was made from slag and a part by the fusion of natural rock, the latter being the more valuable.

Phosphate Rock.—The production in 1898 was 1,257,645 long tons (\$4,-355,025), against 1,007,367 (\$3,022,101) in 1897. The increase was due especially to Tennessee and the land rock deposits of South Carolina. Phosphate mining was generally prosperous in 1898 on account of the higher prices.

Talc and Soapstone.—The production of soapstone for slabs and other manufactured articles in 1898 was 18,862 short tons (\$158,635), against 16,-904 (\$169,040) in 1897. The decrease in value was due to a largely increased production of very low grade stone. The production of common talc, mostly ground to powder, was 9,112 short tons (\$78,645), against 10,164 (\$90,908) in 1897. This was produced chiefly in North Carolina, Pennsylvania and Vermont. The production of fibrous talc, all of it from St. Lawrence County, N. Y., was 54,807 short tons (\$285,759), against 52,836 (\$283,685) in 1897.

Silica.—The production of vein and dike quartz in 1898 was 35,593 short tons (\$73,313), against 28,407 (\$55,817) in 1897. This material was used chiefly in pottery, for packing acid towers, and for grinding for various purposes. The production of grindstones, which are made out of quartzite, or a very hard sandstone, amounted to 38,859 short tons (\$438,675) in 1898, against 36,502 (\$342,186) in 1897. These were produced entirely in Ohio and Michigan. The production of oilstones, scythestones and whetstones in

1898 was valued at \$107,990, against \$97,229 in 1897. Utah produced 144 short tons of pumice stone, valued nominally at \$720, against 1,700 (\$8,500) in 1897. There was a production of 1,865 short tons of tripoli, valued at \$3,367, against 1,631 (\$5,475) in 1897, most of this product being obtained in Missouri. The production of diatomaceous earth in the United States in 1898 was 1,392 short tons (\$11,002), against 3,000 (\$30,400) in the previous year.

Slate.—The production of roofing slate in 1898 was 1,136,632 squares (\$2,958,496), against 932,124 (\$2,829,529) in 1897. Both Pennsylvania and Vermont made large increases, but this, together with the fierce competition among the producers, reduced the average price of the product. The production of slate manufactures, chiefly blackboards and structural material, was valued at \$528,856 in 1898, against \$595,105 in 1897. School slates are not included. The production of slate pigment, including Baraga graphite and various kinds of mineral black, was 7,886 short tons, against 6,857 in the previous year, the values of the products after grinding being respectively \$70,671 and \$57,863.

PAY DAYS IN THE MONUMENTAL TRADE.



HE English and Scotch stone cutters in the monumental trade have been having considerable discussion over the question of weekly payments. Finally the matter was referred to Prof. Dave Wilson, and his decision will be read with a great deal of interest in America. Prof. Wilson says:

The parties having left it to me to say whether I think the wages in their trade should be paid weekly or fortnightly, I have duly considered the matter, and in particular the statements and arguments which on both sides were submitted to me temperately and clearly. As it appears to be the almost universal practice in Aberdeen to pay wages of workmen weekly (there being only two exceptions to that practice of any importance), I think I must assume that, on the whole, weekly payments are those which are found to be the most suitable, and therefore that special grounds ought to be shown if the trade of granite cutting is to be an exception. The question thus comes to be whether sufficient grounds have been stated for dealing exceptionally with it. This question is one of difficulty, on which I can easily see that reasonable persons may very well hold opposite views, but the opinion to which I have come is that sufficient grounds for making an exception have not been shown. Three grounds were brought forward by the Granite Association which require special consideration. Firstly, that weekly wages would involve additional expense to the employer, which the trade in its present circumstances could ill afford; secondly, that the monumental trade was one in which the employers had frequently to be away from home; and that, in the case of the smaller employers, of whom there were many, it would be difficult to get persons to attend to payments in their absence; and, thirdly, it was pointed out that after pay days there were often irregularities in the attendance of some

of the workmen; and these irregularities, it was urged, would naturally increase if the number of pay days were doubled. With reference to the first ground, I have no doubt that there will be additional expense if a weekly pay sheet has to be made out in place of a fortnightly, but it cannot be a great expense, and the expense, such as it is, will be apportioned pretty accurately to the size of the business, and in a small business with few workmen must, I think, be trifling. If almost all other businesses in Aberdeen, many of which must have their difficulties just as much as the granite cutting business, can manage to do with the expense of this practice of weekly payments, I cannot see that it can be any great obstacle. As to the second ground, I think it should be capable of being got over. When an employer goes from home he must leave some one in charge. The person he selects for that purpose will naturally be a person of honesty and common sense, and such a person should, it seems to me, not have difficulty in occasionally giving out wages. As to the third ground, I was surprised at the figures which were given me as to the extent to which some workmen absented themselves after the fortnightly pay days. It would be wrong to hold the whole body of granite cutters, or even any considerable proportion of them, responsible for the practice, but there is evidently a minority, possibly a small one, who indulge in it to an extent which one does not expect to find in a respectable trade. The persons who indulge in the practice know best what their reasons for it are, but they ought to be made by their fellow-workmen distinctly to understand that it is a practice which is neither creditable to themselves nor fair to their employer; and, moreover, that it is much against the interests of their own order, because every practice which inflicts unnecessary loss upon an employer simply diminishes by so much his capacity to pay a fair wage. Therefore I would have had no difficulty in holding that, if this practice, to whatever extent it may exist, was to be increased by weekly pay days, they ought not to be sanctioned. But what I am by no means certain about is, that the fortnightly pay day does not aggravate the mischief. The case of a man whose habits are put off their balance by the receipt of money is, as likely as not, made worse by his one week getting no money and then the next week getting twice as much as in its course as he ought to require. I rather think the weekly payments ought to diminish the regrettable practice to which attention has been drawn; and I should hope that public opinion among the workmen would speedily put it down altogether. For the reasons I have now stated I have failed to find sufficient ground for the payments not being weekly. On the other hand, I cannot doubt that there are considerable advantages to the workmen, both economically and socially, in having their wages so paid. It ought to help them to avoid the taking of credit, which has always to be paid for, and which must often lead to imprudent expenditure. I accordingly award that the payment of wages be made weekly.



FAMOUS SINGLE STONES.

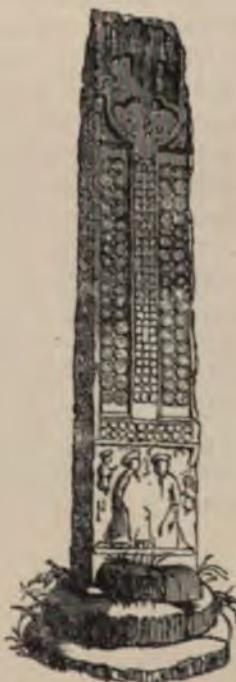
“SUENO’S STONE.”

THE two views given herewith represent two sides of a very ancient monument now standing near the town of Forres, in Moray, Scotland. In the absence of all authentic evidence, it would be vain attempting to ascertain the precise period at which this memorial was erected, or what particular event it was intended to celebrate. Pillars of this description were commonly set up, either as sacred memorials to denote the places where Christianity was first taught, to mark the graves of distinguished individuals, or to perpetuate some great victory.

Many opinions have been hazarded as to the origin of this splendid memorial, differing as widely as possible from each other—one commonly



SUENO'S STONE: NORTH FACE.



SOUTH FACE.

received opinion being that it was erected to commemorate the victory of Forres, obtained (according to Shaw in his "History of Moray," 1775) by the Danes, under the generals of Sueno, in 1008, over the Scots under their king, Malcolm, who was severely wounded in the battle, and its appellation of "Sueno's Stone" would seem to favor such an opinion, whilst others have surmised, with equal probability, that it was erected to commemorate the final expulsion of the Danes from the coast by the same king.

In Gordon's "Itinerarium Septentrionale," published in 1726, is given a very detailed account of this monument, which, as it was written nearly 175 years ago, and corresponds very accurately with its present state, considering the time that has elapsed since, it may not be amiss to transcribe. "The stone near the town of Forres, in Moray, far surpasses all others in magnificence and grandeur, and is, perhaps, one of the most stately monuments of that kind in Europe. It rises about 23 feet in height above ground and is, I am credibly informed, no less than 12 or 15 feet below, so that the whole height is at least 35 feet, and its breadth near 5 feet. It is all one entire stone. A great variety of figures in low relief are carved thereon, viz., on its north face some of them still distinct and visible, but the injury of the weather has obscured those on the upper part. What the import of these figures is I am at a loss to determine. The whole above ground is divided into seven compartments, the lowest of which is almost hid by some steps or supports, lately made to secure it from falling. The second contains sundry figures, but most of them defaced. In the third I discovered several of a monstrous form, resembling four-footed beasts with human heads, and others of men standing together. In the fourth division are six or seven ensigns or standards, with some figures holding obscure weapons in their hands. The fifth and sixth divisions are filled with the like figures, and in the uppermost of all have been others which are now in a great measure defaced. On the reverse side (the south face) is a cross like those at Aberlemny (near Brechin), beneath which are two human figures, of a very disproportional or Gothic form. I have reason to think that where figures of armed men, and standard and military ensigns appear, these were undoubtedly designed as trophies of victory."

The carvings on this celebrated stone were excellent and remain in evidence of the skill and dexterity of the old Gothic masons. The outlines of many of the figures are still extremely distinct, and the singularly beautiful interlaced work on the borders and sides, and the elaborately carved Celto-Runic knots on the south face of the pillar are very perfect at the present day; the latter showing it to be a memorial of very remote antiquity, whilst the cross clearly denotes its erection to have been at a period subsequent to the Christian era, and establishes the fact that it was not set up by the pagan Danes.

FRED T. HODGSON.

BUILDING STONE IN IOWA.

IN many of the States of the Union admirable geological surveys have been issued at times in the past, but a surprisingly small number of them keep this important class of information up to date. Having once published reports giving the scientific aspects of the geological formation of the State, the public officials do not realize the necessity of issuing the facts and figures dealing with the ever-changing economic questions. No record whatever exists of vast quarrying operations that have opened new sources of wealth for the State. This is true of some of the largest stone producing commonwealths in the Union. An honorable exception in this line is furnished by the officials of the Geological Survey of Iowa. Every year since 1892 has brought out an admirable report from this State, with the result that the mineral industries have been fostered and encouraged. The Annual Report for 1898 with the accompanying papers, has just made its appearance, the work of Samuel Calvin, Ph.D., State Geologist, and H. F. Bain, Assistant State Geologist. Some of the interesting statistics from the volume are summarized below.

The value of the total mineral production in 1898, as shown in the "Statistics of Mineral Production," by S. W. Beyer, was \$7,787,579, distributed as follows:

	Value.	Number of producers.
Coal	\$5,123,187	188
Clay	2,057,022	349
Stone	563,586	161
Lead and zinc	43,784	10
Total	\$7,787,579	708

The stone trade for 1898 was indeed encouraging. The producers reported almost without exception the demand for stone to run from 10 to 20 and even, in a few instances, 50 per cent. better than 1897. The demand for lime shows very little improvement over the preceding year. The stone quarried includes limestone, dolomite and a small quantity of sandstone. Most of the quarries are small and improved machinery is to be found in but few. Returns have been received from 161 producers and show that a total of \$563,586 worth of quarry products were marketed during the year. The production was distributed as follows:

Limestone—building and roadmaking.....	\$447,424
Lime	109,600
Sandstone	6,562
Total	\$563,586

In 1898 the State ranked nineteenth among the stone producers and ninth in the value of its limestone.

The value of the stone produced in Iowa during the five years preceding 1898, according to the United States Geological Survey, was as follows:

1893	\$565,374
1894	673,269
1895	468,826
1896	462,128
1897	495,343

The decline in sandstone is more fanciful than real, and was largely due to an erroneous classification. The Mason City and Iowa Falls dolomites were listed as sandstones in former reports.

Mr. T. H. Macbride contributes a study of the "Geology of Humboldt County," in which he gives the following figures concerning the economic products:

The exposures of Kinderhook and Saint Louis limestones, already described, have, from the earliest settlement of the county, furnished an abundant supply of rubble stone, much of it of a superior quality. From Dr. Welch's quarry were taken stone for erecting the fine buildings of Humboldt College; this in the early history of the town. From the same quarry came the rock for the piers of the bridge of the Chicago & Northwestern Railway, erected in 1881 south of Dakota City. In the city of Humboldt quarries are common, and numerous handsome stone business blocks attest the activity and energy of its people. Indeed, it is said that the rock necessary for the walls of a business house in Humboldt may often be obtained in excavating the cellar. A beautiful stone school house attests the excellence of the local supply for quarry stone. Mr. Bull's quarry is the only one now operated in the city. The rock over the area uncovered has been removed down to what appears to be the old surface of the Kinderhook limestone. According to reports given by workmen the deeper layers are less valuable. In fact, here, as often elsewhere, the strata of quarry rock are not uniform, and for practical use the rubble must be carefully culled.

Reference has been made also to the excellent limestone in Weaver township, in the northeast quarter of Section 9. No better stone for general use can be found than this. It is a crinoidal limestone, occurs near the surface, and is quarried with little trouble.

The flourishing town of Gilmore uses rock from the Gilmore quarries. This rock, which is certainly, in its upper beds at least, the same as that last mentioned in Weaver township, is widely known, has been quarried and shipped in hundreds of carloads, having the advantages of railway transportation. This quarry is in Pocahontas County. It is mentioned simply to show the possibilities in Weaver township if supplied with equal transportation facilities.

The Stearns quarry, in the northwest quarter of Section 3, Corinth township, is another excellent exposure of building stone. The beds here are much heavier than in most of the neighboring quarries, and rock suitable for bridge piers may be easily obtained in unlimited quantities.

Lime has been manufactured from stone taken from all horizons of the Humboldt County limestones. The oolite in particular was at one time extensively quarried at Humboldt for this purpose, a fact attested by several well

constructed kilns still standing, but unused. The lime produced serves excellently for local and immediate use, but it is said to be ill-adapted for shipment, on account of rapid air-slaking. It appears that at present, even for local use, lime manufactured from the magnesian Niagara limestones is generally imported.

Sand, suitable for building purposes, is not lacking, and is obtainable at various points along the river. A peculiar bed of white sand in the northeast quarter of Section 34, Rutland township, has been extensively excavated for this purpose, and deserves more thorough exploration.

The clays of Humboldt County are not generally well adapted to the manufacture of brick or tile. The Wisconsin contains in general too much lime. Nevertheless, brick making has been successfully conducted at Dakota, and the court house and jail are built of brick, said to have been burned near by. This was many years ago. At present the old kilns operating in the county are at Livermore, where the Stitch Bros. have been busy some three or four years in the manufacture of brick and tile. The clay made use of appears to be Wisconsin. It is found in a marshy region, and close to the surface. Every effort is made to free the clay from pebbles, but nevertheless a sufficient number remain to make the manufacture of brick uncertain. Messrs. Stitch manufacture soft brick only, and many of these are rendered worthless by pebbles of limestone, which in process of manufacture burn into quicklime. But, notwithstanding all difficulties, the firm manufactures brick, and sells them at the rate of from 200,000 to 300,000 per year. The company is more successful with tile, which requires, it appears, less burning. Tiles are burned at the rate of 300,000 or 400,000 per year, and the demand exceeds constantly the present capacity of the plant. Fort Dodge coal is the principal fuel used. Taking into account the unusual difficulties to be overcome the enterprise is a remarkable success.

Mr. S. W. Beyer considers the "Geology of Story County," and says of the building stone of the county: Story County is poorly supplied with stone suitable for structural purposes. The Saint Louis limestone affords a limited quantity of stone adapted to foundation work and use in the rougher grades of masonry. The rock is, as a rule, highly absorbent and does not stand frost well. Its earthy-buff to gray-buff color gives it a dull, somber appearance, which increases rapidly on exposure on account of the readiness with which it takes up foreign matter. Some quarrying has been done at nearly every one of the outcrops in the county, though in no instance does the annual output of any single quarry exceed a few dozen cords of rough stone. Well borings and other artificial excavations seem to indicate that no other quarry rock may be looked for in the region. The drift, especially in the morianal regions, affords great numbers of bowlders suitable for nearly all purposes to which stone can be put. They range in size from the cobble to great blocks, large enough and of suitable quality for monuments. In the early history of the county bowlder land was very much shunned by the pioneer settlers, and any attempt to render it arable was sure to prove a heroic test of the Christian fortitude of the would-be tiller. Splendid granites were piled up in fence corners and along the roadways. In recent years the bowlders are being rapidly transformed into shapely blocks which appear in the foundations of substan-

tial structures. It is found that these rough masses of stone yield readily to skilful treatment, and when tastefully arranged in a wall the effect is most pleasing and the structure is almost imperishable. In a measure, then, the Pleistocene bowlders make good the deficiency of structural materials in the older terrains.

The "Geology of Muscatine County" is described by J. A. Udden, who says: In the west end of the county, and in the southern townships, there is no stone of any kind except a few bowlders. Over the east half of the county small quarries are quite frequent, especially along the rivers and the larger creeks. Good building stone is found, but not in such quantity or in such locations as to have encouraged extensive quarrying. Stone is taken out merely to supply local demand.

The Fayette Breccia.—The lower ledges in Gatton's and Wresley's quarries, southwest of Moscow, consist of the fossil-bearing upper part of the Fayette breccia. This is a strong, pure limestone of compact texture, in heavy beds. The upper ledges are more brittle and more cut up by joints, and have been used by the Chicago, Rock Island & Pacific Railroad for riprapping and ballast. The stone from Wresley's quarry was used in the construction of the old mill dam in the Cedar at this place. Some of the lower unfossiliferous part of the breccia has been taken out for local use in the west bank of the Cedar above Moscow, and also in Section 3, northeast of Moscow. This rock is a very pure limestone, and in Illinois it is crushed and sold to glass manufacturers, who use it as a flux. Whether it would pay to furnish this rock for the same purpose from Moscow would probably depend on facilities for quarrying and handling and on the cost for transportation.

The Cedar Valley.—Other limestone quarries all belong to the Cedar Valley stage. Those on Pine Creek are mostly in the calcareous and highly fossiliferous ledges, and yield a hard stone, sometimes in rather thin courses. The rock quarried along the bank of the Mississippi and in the creek east of Montpelier is a blue, dolomitic limestone, of an even texture, in heavy beds. It turns yellow and slightly harder on exposure. It has been used by the railroad for riprapping between Montpelier and Muscatine, and has lately been taken out on Mr. Charles Bar's property, near the mouth of Pine Creek, by the contractors, who transport it on barges down the river, where it is used by the Government in the construction of wing dams.

The Des Moines sandstone is soft, usually light brown or yellow in color, and quite variable in texture as well as in hardness and color. It is easily worked, and this perhaps in part accounts for its general use in Montpelier and Sweetland townships, where several farmhouses and one small church have been built from it. It is quite durable, and the ferruginous ledges harden with age. Three quarries have been worked more than the others. One of these is in the west bluff, on the west branch of Pine Creek, near the north line of Section 18, in Montpelier township, on the land belonging to Mr. Charles Alteneder, who opened it many years ago. At this place the rock lies in heavy beds, some being four feet thick. The quarry wall now rises sixty feet from the bottom. The stone is rather fine in texture, and has some peculiar wavy, ferruginous bands, that seem to be due to infiltration or iron from percolating water. Another quarry is in Section 21, in the river bluff in

Sweetland township, and belongs to Mr. J. Stark. The stone is about the same kind as in Alteneder's quarry, but a little coarser in texture. At neither of these two places has much quarrying been done lately. More rock has been taken at the quarry on Lowe's Run, in the northeast quarter of Section 32 in Bloomington township, west of Muscatine. The stone at this place is less ferruginous and of gray or yellowish-white color, with here and there a layer of darker shade. This quarry belongs to Mr. Jesse Oaks. Considering the quality of the stone from these and some other quarries in the Des Moines, it seems that it might with advantage be more generally used. Some imported sandstone is neither stronger or more lasting than much of this rock. The chief objection that can be urged against it is that it is somewhat variable in each quarry, and the occasional delivery of stone of inferior quality may have prevented a more frequent use of the better kinds of the home product.

Good gravel is scarce in this region. Some has been taken out along the railroad in the east bluff of Mad Creek, near the northwest corner of Section 25 in Muscatine township, and has been used for ballast on the railbed. About one-fourth of a mile northwest of this place there is another old gravel pit on the property of Mr. Samuel Sinnett. The deposit is about four feet deep, resting on a yellow till and overlain by loess. It is variable in texture, changing from sand to coarse gravel with large boulders. A somewhat more extensive deposit of gravel and sand occurs under the Kansan till in the bluff near the center of Section 6, in Fruitland township, on land belonging to Mr. Charles Warfield and to Mr. Charles Miller. This gravel is in part sand. Some years ago it was used in macadamizing the Hershey avenue road for a distance of three miles west of the city of Muscatine. In the railroad excavation recently made west of Stockton, a gravel was uncovered in the west side of a low, flat hill which lies to the south of the road, and it was used for ballast on the roadbed. The deposit was not far from twenty feet in depth in one place. Most of the pebbles consist of Devonian limestone. It changes into sand above. This gravel will no doubt become useful in the improvement of the roads in the vicinity.

Sand for mortar is usually obtained from recent and alluvial deposits along the streams. East of Moscow the Chicago, Rock Island & Pacific Railroad has worked a sand pit for road ballast. This sand is white and rather free from gravel.

Scott County is treated by W. H. Norton, who writes: Superior building stone is well distributed throughout the county. The Silurian in the Anamosa type of the Gower, furnishes cut stone unsurpassed in quality in the State, and, in its heavier layers of coarser grain, a stone practically indestructible for bridge piers, culverts and heavy masonry generally.

The quarries about Le Claire are the best developed of any using the Anamosa stone. In the quarries of F. H. Thielman and of Velie & Nason the light buff dolomite runs in even courses about one foot in thickness, traversed by vertical joints so distant that stone can be taken out in dimensions far in excess of any possible demand. No channelers are used, but the stone is uniform of texture and can be broken with fairly even fracture along the lines desired. The color is slightly warmer than obtains in the Anamosa quarries. The rock can be easily dressed or sawed when green, and it contains no in-

jurious constituents, such as quartz or pyrite. At the Rock Island Arsenal it has been laid in dressed stone, but rockfaced ashlar will usually be found the most pleasing cut. The overlying stripping of glacial clays is rather heavy and seriously increases the cost of working some of the quarries at present. But if railroad facilities were offered, encouraging the development of the industry, all this stripping could be handled at slight expense by hydraulic machinery. The localities where the Anamosa stone occurs are without railways, and for this reason the quarry industry is but little developed. In no quarries has modern machinery been introduced. The stripplings are removed with spade and barrow, and the rock is quarried by means of the jump drill, the wedge and the crowbar.

The strength of the stone is more than adequate to any strains it is likely to bear. Sample blocks from F. H. Thielman's quarry tested by Prof. A. Marston, Iowa Agricultural College, withstood 1,200 pounds per square inch, proving it a stronger stone than such well-known stones as the Berea sandstone and the Bedford oolite.

The heavier, coarser grades of the same type are nowhere found near enough to railways to warrant any working of the quarries beyond the supply of local needs. Much of this stone lies in layers about 2 feet thick, with moderately smooth surfaces, and, while highly vesicular, its cavities do not injure the stone for purposes of heavy masonry. As a dolomite it is more resistant to the chemical attacks of the weather than is ordinary limestone, and it endures frost, as many stones of finer grain cannot do.

The Devonian furnishes some very good building stone, the most durable being that from the Upper Davenport beds. This stone is rough and hard and not easily brought to desired shapes and sizes. On the other hand, it is exceedingly tough and durable, of a beautiful color, and where properly dressed and set, rockfaced ashlar is most pleasing; it leaves little to be desired. Trinity Church, Davenport, is an example of the architectural capacities of the stone. The geological section of the Davenport quarries supplying this stone, which is used to a considerable extent about the city, has already been given. The only quarry reported is that of Mr. H. G. Schmidt, whose output was for 1897 some 3,000 perch, quarried chiefly for rough and rubble and road work.

The Lower Davenport beds, in their lower layers as exposed between Davenport and Gilbert, afford a very fair and durable building stone. It is of this stone that the cathedral of the Protestant Episcopal Church was built. Most of these beds are of no value for masonry, soon breaking up into thin calcareous plates and chipstone on exposure to the weather. The chief quarries are Louis Gomel's and Boland Andre's near Camp McClellan, which supply a large amount of excellent crushed stone for roads and streets.

The Cedar Valley limestones are for the most part too argillaceous to afford building stone of good quality. Several layers of the lower beds constitute a fair stone, and large quarries are now worked in them near Buffalo, chiefly, however, for rough and rubble and road work. L. E. Dutcher's quarry, about two miles east of Buffalo, worked, when visited, by about thirty men, besides teamsters. The rock is easily handled. Scarcely any stripping is necessary. The stone is blasted out of the ledges, broken up with the sledge

and carried on wagons a few rods to the bank of the Mississippi, where it is loaded on barges for Government use in riprap and on dams. Some also is used for road material in adjacent townships.

At A. C. Walker's quarry, one-half mile east of Buffalo, the same kind of rock is quarried and for the same purposes. About thirty-six men and fourteen teams are employed. In 1897, 25,876 cubic yards were quarried, valued at \$13,782.

The Le Clair beds of the Gower stage offer an inexhaustible supply of a stone unsurpassed in the United States for the manufacture of lime, but the industry remains almost wholly undeveloped, and largely for want of facilities for transportation. Thus the lime quarries of Le Claire are unworked, while across the Mississippi lime burned from the same rock has made the name of Port Byron a familiar term to architects and builders.

Mr. H. Schmidt has supplied local needs, for a number of years, from very pure lime rock quarries near Dixon. At Gilbert, Mr. H. Kuehle & Son burn the Lower Davenport beds, whose freedom from clay, quartz and iron insure a lime of great purity. As a non-magnesian limestone it produces a hot, quick lime admirably adapted for many manufacturing purposes. Several paper and straw mills have been supplied with it in three adjacent cities. A new draw kiln is now building. In the pot kilns in use in 1897, \$675 worth of lime was burned.

THE SHOCK AND THE EXPLOSION TESTS OF CEMENT.*

HE ordinary tests of tensile strength and of resistance to compression practiced progressively might be sufficient for all cement works which have to bear constant pressure, or only a slowly varying one. However, it appears necessary, or at least useful, for the cements used in fortification works, which have to support the shock and the explosion of projectiles, to submit them to the action of a stamper in the shape of an overloaded shell, falling repeatedly from a variable height. Let us see how these tests might be performed.

Blocks of concrete might be submitted to successive and graduated shocks in such a manner as to become more and more violent until rupture occurs. The same concretes might be submitted to the smashing action of explosives placed in their center, the charges being progressively increased till complete dislocation takes place. The cements of different production, worked with the sand and the stones used on the different works, should be submitted to these progressive tests.

The results which one might expect are numerous. First of all, they would allow comparison of the usual tensile and compression strength tests, and of the shocks and explosives tests. Then they would give means to test the practical strength of cement; they would show which sand and stone of a country are best, and which is the proportion of both giving the best results.

* Translated by the Author from "Chemiker-Zeitung."

As it might be seen, these tests would allow us to know more about practical hardening than the tests performed on small briquettes. The practical strength of the cements of different manufacture would become known by the shocks and explosives tests, and then it would be relatively easy to identify all these different cements by the usual tests in the daily course of manufacture and receipt of cements.

For the shock tests, a pile-driving engine would have to be established under a light building. The cement block to test should be a cylinder of 10.40 metres diameter and 0.50 metres high, placed on an anvil of granite in a central position, plainly defined by three steel points fastened in the anvil. These points should correspond to cavities reserved in the block during its moulding. The shock might be produced by the fall of a monkey in the shape of a shell, the point of which is steel, and weighing 50 kil. for the concretes of recent fabrication, and 100 about kil. for the older ones. The metallic pile-driver (ram) consists, at the inferior part, of six uprights in L-shaped iron fastened in the bottom of a concrete foundation. These uprights are fitted in the anvil and rise about 3 metres above the ground; four other L-shaped irons strengthen the preceding ones, and lengthen them vertically in order to give a profitable full height of 4 metres. Five iron crowns with tie-pieces join in a stable manner the pieces of this building, and support the slide-bars (guides) of round iron which have to guide the fall of the monkey. Besides, the apparatus consists of a fixed pulley, of a mobile disengaging one, of a rope, and of a winch (with living shell). Iron bars reunite the six uprights at the height of the upper part of the anvil. On a graduated perch, fixed at one end of the vertical pieces of the building, is a mobile index, the finger of which describes a horizontal plane, in such a manner as to stop the ascension of the monkey at the desired height. The fixed guides of the travel of the monkey are interrupted at a certain distance from the top of the block in such a manner as to avoid a production of contact, and thus the wear of the organs when the monkey leaps again by the shock. At the same time the lower crown of the building prevents a lateral yielding of the monkey. On the other hand, two stirrups, acting as springs, detain the monkey by the ends when it endeavors to fall down on to the anvil after breaking the block. The interior form of these stirrups also guide the handles of the monkey towards the fixed guides in the beginning of the ascension. Finally, a wire-lattice with narrow meshes is placed at the height of the block on the side of the anvil near the winch. A similar wire lattice protects from the splinters the glass window of the building and the two necessary operators. The two windows and the glass door of the building, which is free on three sides, appear to be sufficient for the easy observation of the cracks produced in the block, and especially because the block is at the same time more or less lifted by the anvil.

The block is brought on a small cart to the anvil. The pile-driving engine being placed in an eccentric position to the general building between the building and the anterior part of the timber-work, there will remain sufficient space for the inspection and the repairs.

The above installation is for blocks of 160 kil. which have to be removed frequently, the experiments being continuous ones.

The shocks might be allowed to vary from 1 to 16, when we take as unity the pressure of the monkey of 50 kil. falling from 0.50 metres.

Which is the method which has to be used in these shock tests? We might admit, for instance, that if a block of concrete of a good Portland cement worked in special determined conditions can stand without springing and splintering a tally of 10 strokes of a monkey of 100 kil. from 1 metre height, and, when the cement concrete is split only after several blows of the same monkey (falling) from 2 metres, any cement tested under the same conditions which would not stand the first tally of 10 strokes should be rejected, or then only be used in a stronger proportion with less sand and stones. The cost per block would amount to about 2 shillings.

For the explosive tests, two different series might be performed.

In order to test on a large scale, cylindrical blocks of 3 metres diameter, and 1.20 metres high, should be formed, so as to produce a volume of about 15 cubic metres. These blocks should be kept in an unfrequented place, realizing the conditions of security required. These blocks should be kept a determined time. A few months afterwards rupture tests may be performed. For instance, a detonating petard of about 1 kil. of melinit would be placed without tamping on the block and in the center. The action of the explosion would produce a kind of funnel, at which a new charge of a known quantity would be placed again, and so on, the aspect of the block being carefully examined and noted after each discharge. The experiments should be carried out with the different cements and with the different sands, one or two blocks being utilized for each. As the expense of each one of these tests would be about £20 (but far less for the manufacturers), the tests might be carried out on a limited scale, but at the same time smaller tests might be made in a regular manner.

Concrete cylinders of 0.40 metres diameter, and 0.50 metres high, are placed in a mound, in the center of which a wooden mandril is plunged, the length of which being sufficient to lean below a concrete thickness equal to the radius of the cylinder. The diameter of this mandril should be 0.40 metres; its surface made greasy in order to facilitate its removal when the concrete has hardened. After a few months (six months, for instance), a charge of sporting powder is introduced in the bottom of the cylindrical central volume. The powder is contained in a little sack fixed at the end of the mandril, which acts in place of tamping after the overthrowing of the block. A lateral cylindrical groove is made in the mandril, to receive the quickmatch (matchcord), the extremity of which has been brought to the center of the little sack for the regular performance of firing. Then the concrete cylinder is set down by means of a system of pulleys in a small pit, analogous to those in which hollow projectiles are burst. The lower part is supported in the uneven parts of the pit by means of wooden wedges systematically placed. All this is covered by a strong board, the under part of which is provided with jutting cross-pieces, in order to let the gas produced by the explosion escape, and to detain the splinters. To the same purpose the upper part is loaded with weights, placed on and lifted up by the pulleys. A small board, screwed under the stronger board vertical to the block, will act as a stopper. After the firing, the board is lifted off, the fragments of the block are gathered and weighed, and

at the same time notice is taken of the number and of the position of the ruptures.

The weight of the block of 125 kil. seems adapted for a comparatively easy manipulation; its volume is such that a relatively slight charge will be sufficient to crack it in such a manner that, with observance of a few precautions, these experiments could be carried out anywhere. Ordinary sporting powder will answer the purpose, as it is "quick," easy to manipulate and to fire. Further, it is exceedingly easy to get it in a very regular quality. The cost of these bursting experiments would not be very high, the expenditure for each block being at the utmost 2 shillings.

EUGENE ACKERMANN.

THE COLORADO DIKES OF PHONOLITE.



PROF. ARTHUR LAKE has written an article for "Mines and Minerals" on the interesting and little known rock phonolite. Prof. Lake says:

Among rocks there are a few which are especially noted for their connection with the precious metals. Phonolite is one of these. We heard little of this comparatively rare rock, until it was brought into prominence by the gold-bearing dikes of Cripple Creek. Since then, miners and prospectors have been anxious to claim its presence in their finds in parts of Colorado remote from Cripple Creek, but so far in Colorado, we have no proof of its existence, outside of the region in question. The only other region in the United States where it is known, is in the Black Hills of Dakota. In Europe and the Old World is not uncommon, but does not seem there to be remarkable for its association with the precious metals.

It is not a rock easily recognizable in the field. Many other common eruptive rocks such as felsite, trachyte, rhyolite, etc., might readily be mistaken for it, and outside of Cripple Creek, where the miners have become familiarized with its general appearance, it is doubtful if any but a skilled petrographer would be able to pronounce absolutely upon this or that rock being phonolite, and even he would hesitate to do so without a careful examination by microscopic slides.

In appearance the rock is a very ordinary looking one, usually of a drab greenish-gray color, and is more often of a slaty structure than massive. Sometimes a few small oblong crystals of sanidin feldspar are sparsely distributed in a porphyritic manner over its surface. Commonly, however, the rock has more the appearance of an ordinary piece of gray slate.

The feldspars of the phonolites are alkaline. Sections of moderate-sized rhombic, twelve-sided bluish crystals may at times be observed which are the rather rare minerals called hauyne and nosean, and with them are minute hexagonal crystals of nepheline; with these also occurs a greenish-black mineral called oegirine, belonging to the pyroxene family; occasionally, a peculiar blue hornblende is likewise noticeable. The common slaty structure of the rocks at Cripple Creek is attributed by Dr. Cross to the fluidal arrangement

of the tabular feldspars, both large and small, parallel to the walls of the dikes. Also, when the minute feldspars are composed of microscopic bodies called prismatic microlites, their arrangement in planes produces a parallel structure in the rock. Many of the phonolites are very fissile, schistose or slaty, on account of this structure, and split up into thin flakes under the hammer, while the talus slopes of the hills are covered with more or less tabular fragments from the same cause.

The much decomposed phonolite dikes of the volcanic center can be distinguished from those of andesite by this schistose slaty structure. The parallel arrangement of the minute feldspar scales, produces a delicate silky luster. The dull gray-green color of the rock is due, according to Cross, to the development of the oegirine crystals in minute grains as a cementing substance for the feldspar microlites. The rocks have a dull oily luster, and a shell-like fracture. Some of the phonolites are porous in texture, as on Mount Pisgah, with small flattish cavities in them filled with amygdaloids lined with crystals of white analcite and oegirine, visible to the naked eye.

The word phonolite means "ringing rock," because thin slabs of it ring under the hammer, but this is not peculiar to the rock, as several other volcanic rocks will do the same.

At Cripple Creek, phonolite forms sloping table-topped buttes, such as Mount Pisgah, Copper Mountain, Rhyolite Peak, and others. At Bull Head Cliff the phonolite dike shows a rude massive columnar structure. On the other buttes and peaks around Cripple Creek, the rock is a gray mass composed of little slates dovetailing into one another, due to a fluidal and microscopic structure. On breaking the rock it shows a fine-grained structure of a dirty greenish-gray color. The component minerals with the exception of a few sanidin feldspars are rarely visible without the microscope.

A rather peculiar mode of occurrence of phonolite at Cripple Creek is in gently sloping dikes. When the eruption of phonolite occurred from below and ascended through a fissure in the granite rocks, on nearing the surface it found its upward course obstructed by an overlying mass of igneous matter previously poured out on the surface by the Cripple Creek volcano, consisting principally of andesitic tuffs or breccia, and sought the line of least resistance between these friable tuffs and solid granite. When the overlying bodies of tuff and breccia were subsequently removed by erosion the intrusive phonolite sheet was uncovered and found reposing on or near the underlying granite at a gentle angle, much resembling a surface lava flow, and sometimes mistaken for it.

In this way appear to have been formed the gently sloping table tops of Copper Mountain, Mount Pisgah and other notable buttes surrounding Cripple Creek.

In the Black Hills of Dakota, numerous eruptive rocks form the prominent peaks. Of these, Terry's Peak and Sugar Loaf are laccolites and on the western slope is an outcrop of coarsely crystalline phonolite of bluish color, Down Annie Creek, four distinct sheets of phonolite occur, intercalated with Potsdam shales, and on the summit of Green Mountain is a blocky outcrop of leucite phonolite. On Holmes Point is a thick sheet of leucite phonolite covering a considerable area, while Ragged Top is composed of trachyte phono-

lite and near it another phonolite showing the same marked slaty structure as at Cripple Creek.

Quartz, porphyry, rhyolite and phonolite are the prevailing eruptive rocks of the Black Hills and these occur in sheets as well as dikes forming the summits of peaks.

Phonolite would seem to occur in the Black Hills sometimes in surface flows, while at Cripple Creek we have no evidence of surface flows, only of dikes. The phonolite eruptions of the Black Hills do not appear to have that important relation to ore deposits than those of Cripple Creek do, although tellurides and other ores like those of Cripple Creek are found in the district.

The mode of occurrence and distribution of the precious metals in the phonolite dikes at Cripple Creek is now well known. The dikes penetrating both the granite and overlying andesitic breccia have, by a shearage or slight faulting movement, become traversed longitudinally by a series of cracks parallel to the walls of the fissure and to the course of the dike. In these cracks the telluride gold-bearing minerals and free gold occur at the line of junction between the country and the phonolite dikes as a line of least resistance and natural opening for the ascent of mineralizing solutions.

PRACTICAL STONE-CUTTING.*

Explanation of the "PRISMOIDAL SYSTEM METHOD" by means of which the Moulds, Templates, etc., may be developed, as required in order to form the upper piece of coping, the plan, etc., of which is given in Plate 15.

 N Figs. 1-4-5 the letters of reference correspond to those in the corresponding diagrams of Plate 18. From the explanations already given the methods of construction made use of will be apparent from the drawings. In A-C of Fig. 6 is shown the "pitch line" of the coping, E-D shows the rise over the lower tangent A-B, and D-C that over the upper B-C of the plan. The heights, as already explained, are obtained from the direction given in E'-Z-E of Fig. 2, Plate 15.

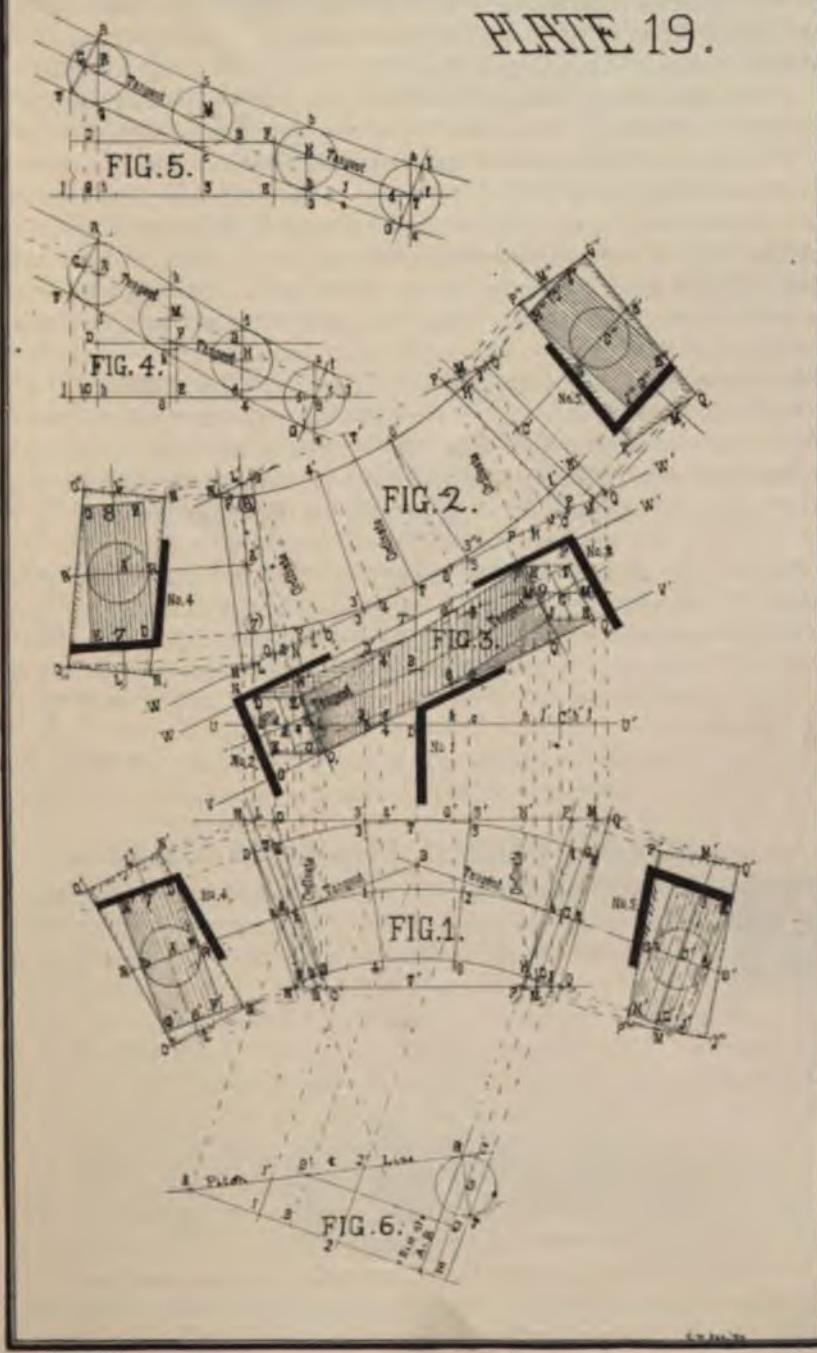
In Fig. 3 is shown the vertical elevation of the solid of the coping, the method by means of which the points 3'-4'-5'-6' may be found has been very fully explained at the like projection of Fig. 2, Plates 13-17, to which we may refer our readers.

The points D-E-H-J, etc., which belong to the joint surfaces, may be found as follows: First, project D-E-H-J, etc., of the plan into D-E-H-J, etc., of Fig. 3. Then set off L-D, d-E, h-H, j'-J, etc., respectfully equal with f-I, d-G, h-R, j-T, etc., of the face moulds, Figs. 4-5. Join D-F, etc., and the projection of the joint surfaces may be obtained. We may remark, the face lines D-7-E and F-8-G, are curve lines, the points 7-8 of the plan, projected in 7-8 of the joint surface of Figs. 3, give the center points through which to draw the curve.

Now to project the tangents and draw the joint lines of the prism: Square with N-Q Fig. 1, draw A-A, B-B, C-C; set off D-B and C'C of Fig. 3, equal with E-D, D-C of Fig. 6. Join A-B, B-C, gives the projection of the planes tangent with the center points A-C of the joint surfaces of the coping.

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PLATE 19.



Now parallel with U-U' through C draw M-M'; then project L-L', and M-M' of the plan, in L-I', M-H' of Fig. 3, and square with A-B draw N-O, N'-O' of the lower, and square with B-C draw P-Q, P-Q' of the upper, which gives the elevation of the joint surfaces which belong to the prism. Now in the manner shown in drawing, project N-O, P-Q, etc., of Fig. 3, in N-O, P-Q, etc., of the plan, then joining N-N', O-O', etc., and the plan of the joint surfaces may be obtained (that of the lower is supposed to be seen from below).

Then in Fig. 2 draw W-W' parallel with W-W' of Fig. 3, and produce the perpendiculars N-N', L-L', 3-3', etc., as shown to meet the line W-W'. Then square over the ordinates of the bed mould, make the length of these equal to that of the corresponding ordinates of the plan, and through the points obtained trace the curves of the bed mould, as directed for the similar operation in preceding plates. Then joining N-N', O-O' and the joint lines as required at the top and under working surfaces of the prism at the lower joint surface may be obtained. In a like manner joining P-P', Q-Q' and the joint lines as required at the upper joint surface may be projected.

The method by means of which the sections of the joint surfaces may be projected has been fully explained in Plates 13-17; therefore the construction will be apparent from the drawings, as will be the construction of the bevels Nos. 1-2-3-4-5, the application of which will be shown in Plate 20.

Taking the total size of the coping as 1' 5 $\frac{1}{2}$ ", the width as 7'-6", then with a scale of equal parts it may be found that the size of the rough stone out of which the coping may be formed will equal the length 3'-10", width 1'-10", height 11", total cubic contents equals 6'-5 $\frac{1}{2}$ ", or a balance of this over that of the tangent system of 2'-8".

C. H. Fox.

STONE VERSUS FRAME HOUSES.

NUMBERS of articles have been reprinted in this magazine from Western newspapers showing that there is a growing sentiment in that section of the country in favor of a more liberal use of stone than has been made in the past. Several articles have been printed setting forth the advantages of stone bridges over those made from other material. Now we take pleasure in presenting the arguments of the Santa Barbara, Cal., "Press," for stone dwelling houses. In view of the untold wealth of the West in admirable building stone, the gradual growth of this sentiment is worthy of every encouragement. The "Press" says:

"The European visitor, when touring through Southern California, is amazed at the wastefulness that confronts him at every turn, not the least of which is that of the stone so generously supplied. Here is the finest building material in the world, right at hand, requiring no expensive transportation, and one whose use would give employment to many hands, skilled and unskilled, and also keep millions of dollars that are now being sent away to the distant northern lumber mills.

"The advantages of stone houses over frame should be too obvious to mention, notwithstanding which, there is a perverse prejudice against its use.

many people thinking it 'damp and cold,' whereas if properly constructed, the reverse is true. Stone is particularly adapted to this climate, maintaining an even temperature inside, and thus being warmer than outdoors in winter and cooler in summer. In damp and chilly England a frame or 'deal' house is a curiosity, stone and brick being in general use, but if further doubt remained, it could be easily settled by inquiry of owners and occupants of the few stone houses in Southern California. In comparison to its size, perhaps Montecito, the suburb of Santa Barbara, has the greatest number, and being on the sea-coast would be most subject to the charge of dampness, but not a trace of it is found. The Waterman, Eaton, Doulton and Knowles residences there, are mainly of stone, while the Cyrus McCormick castle and the large mansion of Mrs. Harriet Harvey are entirely constructed of it, and not from stone taken from a quarry, but chiefly from the large boulders found upon the grounds.

"It is a singular fact that the boulders on the tops and southern slopes of the hills and knolls are mostly soft and useless, while those on the bottoms and northern sides are usually hard, many so hard that they will take the finest carving, as is shown in some of the great stone fireplaces in Mrs. Harvey's home. This house has been completed but three years, but is now covered with English ivy and flowering vines, which on frame houses would have to be taken down every few years to permit repainting.

"While the first cost of a stone structure is somewhat greater than of wood, the excess is partly made up by having the land cleared of the stone, and far more than made up in comfort, beauty and permanence. The saving in the items of repairs, painting and insurance alone being considerable.

"Many varied effects can be obtained in stone, from cobbles set in cement to the smooth cut finish seen in city houses, or the rustic, but rich appearing 'ashlar,' set in courses narrow or wide, according to the taste of the owner.

"Aside from the aesthetic and picturesque, aside from convenience and utility, is the fact that by using stone for a building material in our country homes, a grievous waste will be ended, employment given to local labor and large sums now sent away put in circulation in our local towns."



Comment on Timely Topics

A ST. LOUIS MAN'S MONUMENT SCHEME.

THE St. Louis papers are full of the scheme of a resident of that city, Mr. Frederick W. Fout, for the erection of one of the finest monuments in the world in memory of the heroes of the Mexican, Civil, Spanish and Philippine wars. The idea is to construct a monument of Missouri granite 300 feet high to cost about half a million dollars. The way the money for this monument is to be raised is creditable to the ingenuity of Mr. Fout. He declares that no people have done more for the preservation of the Union than the volunteers of 1861 who now live in St. Louis. Many of these people are entitled, under the act of June 27, 1890, to disability pensions, but are not drawing them because they are in no need of the money. Mr. Fout's idea is that each of these veterans should draw the pension to which he is entitled and turn the check over at once to the Monumental Association. He estimates that this would produce from \$40,000 to \$50,000 a year, and at the end of ten years St. Louis would have, fully paid for by the National Government, a monument that would throw all other memorials of the kind into the shade.

Americans are emulative, and if the St. Louis scheme should go through, many other cities might be tempted to follow the example. We do not believe that local monuments should be built by Government money, no matter how it is obtained. Our country has shown unexampled generosity in its treatment of those who fought for it, and pension rolls should be increased only to help those who need aid. The truest patriotism that veterans who are in comfortable circumstances can show is to waive their claims for pensions. If our soldiers' monuments are to be worthy of the splendid heroism that they commemorate, let them be built by contribution, and not by drafts upon the National Treasury.

STONE DRY DOCKS.

NEVER before in the history of the country has there been a more universal demand for the upbuilding of our merchant marine. Our interests have extended in such a marvelous way during the past two years, and our navy is so steadily gaining in size and efficiency, that there is no reason why our merchant marine should not once more occupy the proud position that it held in former years. But if our shipping interests are to be

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built up, and if our navy is to be brought to the highest state of efficiency, something must be done in the way of increasing our dry dock facilities. We have had enough of inadequate and leaky timber dry docks, and Congress will do well to pay heed to the demand that hereafter the Government build only improved and durable structures of stone. A move in the right direction is the construction of the docks at Boston and Portsmouth, N. H., of stone and concrete. The bids for the new League Island, Philadelphia, dry dock, opened by the Navy Department on Aug. 5, were on the basis of timber construction. But the contract contains a proviso giving the Government the right of modifying the construction of this dock from one of timber to one of stone, in case Congress so authorizes. If such a change is made, a board of officers, of which three are to be civil engineers, will determine the increased price, including a 10 per cent. profit.

The Government has been under unusual and most enormous expenses in connection with the war, but there is no economy in timber docks, and one of the first acts of Congress should be to authorize change in the plans for the League Island dock.

A RARE CHANCE FOR CHICAGO MEN.

TEN rich Chicago men are to be given a chance to perpetuate their names, according to the newspapers of that city. A College of Languages is to be added to the American University at Washington, and this will be erected in honor of Illinois. The designs have been drawn by Henry Ives Cobb, and provide for a building of Corinthian design, with ten pillars of white marble standing at the main entrance. The building will be the most costly and the most conspicuously situated of any college on the 92-acre campus. In front of the entrance will be a statue of Abraham Lincoln. For the construction of this building the sum of \$500,000 is to be raised, and the State of Illinois is expected to contribute half of this sum and the remainder is to be raised by contributions. A Washington man has now gone to Chicago to present his scheme to the wealthy men of this city. His idea is to sell each of these ten pillars for \$20,000 to \$25,000 each. Each man who contributes this sum is to be allowed to place his name in a conspicuous manner upon a pillar. Chicago men have long heads for business, and it behooves the gentleman having charge of the finances to scrutinize his contracts carefully or he may find added to the names upon his pillars some such legend as, "Good morning, have you used —'s soap?"



QUARRYING

The Capital Stone Company, of Washington, D. C., and Alexandria, Va., has been incorporated to conduct a general stone business, developing stone quarries, etc.; J. Forrest Manning is president and general manager; Jacob Viehmeyer, vice-president; Joseph Fanning, secretary, and William J. Aker, treasurer; capital stock, \$20,000.

The Western Stone Company, of Lemont, Ill., now has about 300 men at work. Work was suspended for a short time during the recent heavy rains.

The quarrying equipment of A. Seaman, of Meshoppen, Pa., have been sold by the sheriff.

By an explosion of dynamite, which he was tamping into a hole, Charles Smith, a quarryman employed at the Grant lime kiln, at Freeport, Ill., was terribly injured.

The matter of building the Portsmouth & Ohio Valley Railroad from Wharton, O., north to the stone quarries, six miles, has been indefinitely postponed.

Business is booming at the Red Beach granite quarries, Calais, Me., and enough orders are on hand to keep the force busy for a long time.

Great excitement has been caused among the Italians in the vicinity of Orange, N. J., by the claim that a figure of St. Anne has appeared on a rock in John O'Rourke's stone quarry on the side of the Orange mountains. Hundreds of Italians are visiting the place, nearly every one carrying a medallion of the saint, which is compared with the figure on the rocks. Some of the people assert that they can distinguish the form of the Virgin Mary in St.

Anne's arms. The place where the figure has appeared is about fifty feet up the face of the cliff, which is too precipitous to admit of close inspection. Ten years ago scientists were interested in the O'Rourke quarry through the discovery in the mountain side of basaltic columns similar to those of the Giant's Causeway.

The stone quarries in Orleans county, N. Y., including those in Albion, Murray, Medina and other towns, are doing so large a business that the managers are unable to secure the hands needed.

Sixty Hungarians employed at Redington, Pa., taking out stone for ballast for the Lehigh Valley Railroad, struck for a month's wages due them and for payment every two weeks.

William H. Gross has opened a quarry at Alford, Mass.

Reports say that all of the silica sand quarries in the Pittsburg district and in other parts of the country, have been optioned by the American Glass Company.

The Burlington (Vt.) Press says: "The Columbian Marble Quarrying Company is making shipments regularly from the newly opened quarries at Malletts Bay to the mill at Rutland and there is now quite a stock on hand. The quarries, which are four in number, are being worked and are bringing forth results which are satisfactory, and as their development continues more are looked for. The Columbian people are the pioneers in the Monkton marble district and they express the opinion, which seems to be backed up by uninterested parties, that the colored marble, red in the main, with other color variations,

is the equal, if not the superior, of any of the products of foreign quarries, especially for interior decoration. The four quarries are now completely equipped with derricks and other necessary machinery and are practically in continual operation."

The Penn Stone Quarry Company, of Barneston, Neb., is getting out a considerable amount of building stone.

A strike in the Alton (Ill.) quarries for an eight-hour day, has delayed building and paving jobs.

The Carthage (Mo.) Quarry & Stone Company was obliged to shut down temporarily, owing to a lack of water. The company has started to pipe water to the quarry so that it will at all times have an adequate supply.

Daniel Wehr was terribly injured by the falling of a huge mass of stone from a derrick in the quarry of the Chippewa Sand & Stone Company, at Clinton, O. The Chippewa Company is a Massillon concern.

A premature explosion in the quarry of the Artesian Stone & Lime Works, at Chicago, injured a score of persons, some of them seriously. Stones of all sizes were hurled a great distance, and all of the buildings in the neighborhood bore marks of the explosion. The rock is being blasted for the purpose of making lime and crushed stone.

Achilles Ancorani, who has a contract to furnish stone for a government dam on the Monongahela river, has had trouble with the chief engineer of the Pittsburg & Lake Erie Railroad. Angelo Rensi, who is in charge of Ancorani's quarry at Coursin station, on the McKeesport & Youghiogheny Railroad, set off a blast that threw many tons of rock on the tracks of the Pittsburg & Lake Erie Railroad, and J. H. Atwood, the chief engineer of the road, secured a permanent injunction restraining Ancorani from further blasting. This order has been vacated on the condition that Ancorani gives personal attention to all subsequent blasting. The latter claims that Atwood's action is the result of personal spite. It is asserted that he took twenty-five men to the quarry and destroyed a portion of the defendant's tramway running under the plaintiff's railroad from the quarry to the Monongahela river. Ancorani had made the crossing under a right of way agreement for the owner of

the land and to the satisfaction of the foreman of carpenters and bridge builders of the railroad company. Atwood now contends, it is stated, that timber supports for the railway track would be better than the stone walls that are there and gives this as a reason for destroying the track.

A monster blast was recently set off in the limestone bluff at Falling Springs, Ill. The mine contained almost 2,000 pounds of powder, and the entire side of the cliff was thrown down. The blast was about the largest ever put in at any of the quarries in the Falling Springs district and it required several weeks of preparation. It was closely estimated that 2,000 carloads of rock were loosened by the blast. The hole into which the eighty twenty-five pound kegs of powder were poured was fifty-five feet deep. The shock of the explosion was felt for several miles around.

L. L. Gentner and John Peavey are working a granite quarry at Lincolnville, Me. They have a crew of men at work there getting out paving stone. They have put a crew of men at work repairing the old wharf at Lincolnville Beach near the old lime kiln. The wharf will be extended twenty-five or thirty feet so that vessels will have a good place to load.

The quarries of the Benvenue Granite Quarry Company at Maromas, Conn., will be extremely busy for some time owing to the receipt of an order for 15,000 tons of stone.

The Bangor (Me.) "Commercial" says: "Hall quarry on Mount Desert Island is a busy place just now. The company are at work on the Philadelphia mint job, a United States Government contract. W. C. Clifford is superintendent and Messrs. Joseph Johnson and John Tufts are foremen of stonecutters. The working force is at present composed of 210 granite cutters, fifteen tool sharpeners, six stone boxers, nineteen tool boys, four tool grinders, four carpenters, four job blacksmiths, seventy-one quarrymen, four boss quarrymen, six engineers, nineteen yard men, four draftsmen, six clerks (in store and office), stenographer and bookkeeper—a total of 374 employed. The monthly payroll in June was about \$16,000. The stone cutters receive \$2.70 per day and upward, the wages named being the lowest paid; they work nine hours per day except on Saturdays, when they work but eight. The

company have just set up a large gang of saws for sawing granite, and are now doing good work in sawing ashlar."

The Nashua (N. H.) "Telegraph" says: "A new granite quarry is one of the probable outcomes of a little prospecting on the C. C. Shaw farm near Richardson. The granite found is in thick layers and is of three varieties, blue, pink and gray. Specimens are now out and bear a fine polish. Efforts are being made to raise a stock company in Boston for the development of the quarry and its nearness to the B. & M. railroad makes it seem as though its early opening might be expected."

The Marshalltown (Ia.) Stone Company has purchased and reopened the Rockton quarries, four miles from Marshalltown. The quarries have been thoroughly drained and stripped, a switch has been put in and at present a large force of men are at work supplying the ready demand which has obtained for their product of crushed stone, range rock, foundation and dimension stone. Rockton stone is hard and durable, and has a good cleavage. The officers of the company are F. G. Pierce, president; C. H. E. Boardman, secretary.

Fred Esser, of Aurora, Ill., has received a contract from the Goodrich Construction Company of Rockford, for 2,500 yards of crushed stone. Thirty new men will be taken on at the quarries.

Timothy Kaler, of Seal Harbor, Me., was killed by a falling stone at the quarry of Booth Brothers on Hurricane Island.

Mr. T. A. Pender has leased the Gordon quarry at Rock Island, and will begin working it at once.

The Broken Sword Stone Company, of Bucyrus, Ohio, has been incorporated to quarry stone and burn lime. Capital stock \$10,000. J. Bland, Isaac Nusbaum, John A. Chesney incorporators. They have purchased the Jones Farm on the Broken Sword Creek, near Bucyrus, and have a large force of men at work stripping and getting the quarries ready for active work.

coo tons. The Russian salt industry practically dates from November, 1880, when the tax on salt was repealed. With the repeal of the tax the production was doubled, and the price fell in proportion.

Norwegian Stone and Cement Trade.

An official report received at the British Foreign Office on the Trade and Commerce of Norway for the year 1898 says: The exportation of hewn granite in 1897 had been the largest on record, but last year it was still larger, Great Britain and Germany were the two best customers. The bulk of the exportation of this article takes place from the Fredrikshald, Fredrikstad, and Sarpsborg districts; but smaller quantities are also shipped from Christiania and other places on the west side of the Christiania Ford. Considerable quantities are also quarried at Bohuslan, in Sweden, for Norwegian firms, as the labor there is cheaper. The greater part is shipped in the form of kerbstones (kantsten) and street-paving sets, and, it is said, finds much favor abroad. The quantity exported from Christiania in 1898 amounted to 5,295 tons, compared with 4,508 tons in 1897. Marble found a formidable competitor last year in a species of soap or pott stone (klaebersten) for facing purposes. This latter variety is quarried at Sell, in Gulrandsdal, and is dressed in Christiania. It is a very durable stone, standing effects of fire and climate equally well, and looks very well when dressed. It is well adapted for fireplaces as well as facing purposes. As a proof of the durability of this kind of stone, it may be mentioned that the ancient Cathedral of Trondhjem is partly built of it. Of this stone and marble hardly any is exported from Christiania. Inquiries are often received as to the production of cement in Norway. The only cement works in the country (Slemmestad, in Roken) were fully employed throughout 1898, and are said to produce cement equal to the best produced in other countries. The large amount of building being executed in Christiania, and the consequent increase in the consumption of cement, combined with the rise in wages, have caused a corresponding increase in the price of the article.

Salt in Russia

In addition to the celebrated salt mines in the Crimea, Russia possesses a salt deposit of great extent in the Bachmut district, in the Donetz basin, whence salt has been raised in constantly increasing amount since 1881. The output in 1897 was 306,-



Stone Trade Notes



A vein of silica rock, 100 feet thick, has been found at Clinton, Ohio. A chemical analysis shows that the rock is specially adapted to the manufacture of glass.

James Duncan, secretary of the National Granite Cutter's Union, was given a banquet in Baltimore, previous to his removal to Boston, where the new headquarters of the Union are to be located.

Pittsburg stonemasons, after a short strike, have obtained a rate of 35 cents an hour.

Greenport, L. I., will lay stone flags on all important crossings.

Stone for the new bridge across the St. Joe river at Hillsdale, Mich., has arrived, and work has been begun. The bridge will be 70 feet long and 13 feet wide.

Teamsters employed in drawing crushed stone at Joliet, Ill., have struck for an increase from 60 to 70 cents a load, and as a consequence work on the roads has been suspended.

A new stone dam is to be built at Bolton Falls, Vt., for the electric plant. The face of the dam is to be made of split Barre granite and the remainder of the stone will be quarried near the dam. The dam will be 8 feet thick at the base and three feet at the top and made in a thorough and substantial manner.

The city of Rochester, Minn., is investigating the merits of Winona stone for curbing and other purposes.

The Mantorville, Minn., Stone Company will furnish the cut stone for the \$15,000 schoolhouse to be erected at Stewartville.

The three main buildings of the T. H. Prior & Son stone yard at Trenton, N. J., have been destroyed by fire.

The largest day's business in the history of the Monroe, Mich., Stone Company was last month when the company in one day, with a force of 64 men, loaded 24 cars of crushed stone.

The Lehigh Valley stone crushing plant, near Le Roy, N. Y., that has been operated by A. G. Morris, of Tyrone, Pa., for ballasting the Lehigh Valley road, has been

sold to H. O. Duerr, of South Bethlehem, Pa., who will finish the contract.

New Haven has appropriated \$9,000 for road improvements and the stone-crusher at the city quarry will start up again.

John Emmett, proprietor of a stone quarry at Waterloo, N. Y., is dead, at the age of eighty-two years.

The Journeymen Stone Cutters' Association of New York city is over seventy-two years old. At its meeting place at Brevoort hall is a banner which was carried in parades in 1832. It was the first trades union in this country to make a fight for the eight-hour work day, in 1869, which it won after a strike of over four months, and has maintained it ever since.

Gibson City, Ill., has just completed a mile of road made of crushed stone. The road is built with great care, and yet it cost only about \$2,500.

James Nichols, Jr., a well known stone quarryman of North Amherst, O., is dead.

Hallinan Bros., of Little Falls, N. Y., have been awarded the contract for a stone culvert over the waste weir of the Erie canal in that city.

The building of the Fostoria, O., Stone and Lime Company has been destroyed by fire. The kilns and their contents were saved. The company is in the hands of a receiver.

Wellington, Kan., is trying to have established a vitrified brick plant to make use of the immense deposits of shale along the banks of Slate creek.

Macadamizing has stopped in Altoona, Pa., owing to a shortage of crushed stone.

Thomas H. Browne, of Rutland, who acted as arbitrator between a committee representing the Granite Manufacturers' association of Barre and the Tool Sharpeners' association of Barre, in regard to the tool sharpeners' bill of prices, over which there was a dispute last spring, has filed his report. The tool sharpeners are given all they contended for.

The Marengo, Ind., Manufacturing Company has a contract for furnishing

crushed stone, to be used in the construction of an extensive system of turnpikes in Warrick county. This contract will keep the immense stone crusher of the company at work day and night for several months, and will give employment to 100 men. The Warrick county contract is said to be the largest ever made in the State of Indiana by one county for turnpike material.

Edwin Shuttleworth, of 105th street and East River, New York, is adding to his excellent equipment by putting in a new Gilmour double planer.

The stone cutters employed by William R. Mason, general stone contractor, of Richmond, Va., have struck for a weekly or a fortnightly, instead of a monthly, pay day.

The grindstone plant of the Cleveland Stone Company, at Berea, Ohio, covering over three acres, was destroyed by fire on August 12. It is believed that the fire was of incendiary origin.

Messrs. Yates & York, who are operating at Marion, Ind., have closed a contract with the Parkhurst Curbing Company, for about 15,000 cubic yards of stone. They have ordered a complete plant for their quarry.

A Novel Chapel.

Few places of worship in the country have more interest than the miners' sanctuary in the Myndd Newydd colliery, near Swansea, says a foreign exchange. Situated 750 feet below the surface of the earth, with four long rows of pib-wood to sustain the roof, a rude desk on a large lump of coal for a pulpit, and a series of rough-hewn planks as "pews," it is indeed the strangest of the many strange bethels in wild Wales. Every Monday morning without a break for fifty-four years the colliers have crowded into the novel apartment to ask the blessing of Providence upon the week's work. To the eldest miner present the conduct of the service is customarily intrusted, but properly ordained divines have not infrequently descended into the mine before the Monday's "turn" had commenced, and the whitewashed walls of the little chapel have resounded with that Celtic fervor which Welshmen speak of as the *hywl* (which

no irreverent Saxon should pronounce as *howl*). One motto there is painted near the pulpit: "Os nos heb ddim ser nif nos heb Dduw deyrnasadan wadnaw Mynydd Curiog." Freely interpreted, that is: "If it is night without stars, it is not night without God, for He reigneth under the foundations of the mountain."

The Underground Features of the Paris Exposition.

In the Monde Souterrain, which will form part of next year's Paris Exposition, are to be represented the chief natural and artificial curiosities that can exist underground; and this exhibition will be exactly underneath the dome of the Palais du Trocadéro, the entrance and exit being effected by adits of 1:10 gradient, with mouths on either side of the cascade. The Trocadéro hill chiefly consists of limestone, which has long been quarried for building by the method of leaving in pillars; and the spaces caused by this method of working require special precaution for the foundations of buildings, so that a horizontal section has the appearance of a chess-board with (1) the consolidation pillars, (2) the limestone pillars left in, (3) the portions partly packed with what is left from the old working, and (4) the spaces. It is in this chess-board, as it were, that will be driven the main road, 400 meters (437 yards) long, from which will be turned off the stalls constituting the various exhibits, while the old spaces, with their walls consolidated, will naturally serve for the archaeological reproductions. Among these will be the representation of a mine in the time of the Phoenicians, and another in that of the Middle Ages, with the curious machines and tools of those periods; and dioramas, reproduced from old engravings, will show the various methods of working then practiced, such as the winch driven by a water wheel or by a horse moving inside a wheel like a squirrel in its cage. Other dioramas, showing the aspects of the earth at the coal period, at the jurassic and the tertiary periods, with their remarkable vegetation and their fauna will, remarks M. R. Pitalval, in the "Echo des Mines," give a good idea of the old geological world, the vestiges of which remain in the strata of the earth's crust at the present day.



Marble and Granite



The Booth Bros.' and Hurricane Island Granite Company's portion of the Annapolis contract amounts to \$325,000, and the work remains in the sheds just as the stone cutters left it when they went out. Since the strike is now off the force at Hurricane will be increased to 112 cutters and the force at Waldoboro to 84. The new stone shed at the latter place is completed. It is 200x25 feet.

The Berlin (Wis.) Granite Quarry Company is rushed with orders. The company has just received a large order for granite blocks. A new ledge has been opened about one-half mile north of the main one, to which a sidetrack will likely be built.

William R. Williams, a widely known marble dealer of Prospect, N. Y., is dead, aged 48 years.

The wainscoting and marble work on the new Oshkosh library has been awarded to the Grant Marble Company, of Milwaukee.

Morley & Warren is a recently organized monumental firm at Painesville, O., that is meeting with pronounced success.

The Milford correspondent of the Nashua (N. H.) "Telegraph" says: "People in the granite business are somewhat indignant over the way in which they are being used by the railroads in this place, in rates made necessary in the transfer of freight from one line to the other. The Fitchburg railroad reaches the Kittridge and Stevens' quarries, but when shipments are made via the B. & M. road, the proprietors find it cheaper to use horses to draw their granite a distance of two miles than to use the railroads. The granite men have expected a better state of things, but the realization of these expectations seems as far off as ever."

C. Hecker has started in the monumental business at Plymouth, Wis.

Lewis & Stadler have just established a granite and marble business at 301 Broadway, Omaha, Neb. Mr. Lewis has been for four years a member of the firm of Bloom & Lewis, of Omaha. Mr. Stadler

is a sculptor of fine ability. He studied under foreign masters for a number of years and has followed his art for many years in the East. He went to Omaha from Boston, and is now working on statuary for the Burlington depot in Omaha.

Frank Danforth, of Barre, has bought a half interest in his brother William's stone business at Hardwick, Vt. The new firm will be known as Danforth Bros.

The Lee Marble Company, of Lee, Mass., has been making improvements at its quarry.

The Southern Marble Company, of Marble Hill, Ga., has already shipped over 970 carloads of marble to Providence, R. I., for the State capitol now in course of construction.

The Lincoln Park Commissioners, of Chicago, will pull down the old sea wall, and build a sloping granite beach instead. The shore line will be extended 100 feet further into the lake.

The M. T. Benzie Granite Company, of Montpelier, Vt., is putting on additional men in the cutting shed to fill orders.

The monumental firm of Halter & Musser, of Napoleon, Ohio, has purchased the marble works formerly owned by Lafayette Lewis, at Paulding, O., and will operate both establishments. Mr. Musser will take charge of the Paulding works.

The Syracuse (N. Y.) Granite Company has moved its offices from the Bastable block to the University block.

The Winooski (Vt.) Journal says: "The Columbia Marble Quarrying Company's quarry at Monkton is being opened up rapidly and samples of the marble have been sent to marble dealers all over the country. Some specimens of the marble have warm brown tints mottled with lighter shades and take a high polish. It is admirably suited for interior work."

The New England Granite Company, of Concord, received the contract for the granite to be used in the construction of the new Merchants' and Traders' bank of Buffalo, N. Y.

Messrs. Haines & Aker have started a monumental business at Bloomington, Ill.

The Maine and New Hampshire Granite Company, of Redstone, N. H., is cutting about 250,000 granite paving blocks for the Portland Railroad Company, to be used by them this fall when the double track is laid through Main street to Cumberland Mills.

E. A. Collins has established a monumental business at St. Charles, Ill.

M. B. Johnson has sold his monumental business at Kasota, Minn., to H. A. Gripp.

Joseph A. Hobbs, a marble and granite man of St. Louisville, O., has filed a petition in voluntary bankruptcy. Liabilities, \$2,135.43; assets, \$1,665.

The Daniels Granite Company has been organized at Milford, N. H., with a capital stock of \$10,000. This company will buy the business and plant of D. L. Daniels & Co. The directors of the new company are Judge Robert M. Wallace, president; the Hon. Albert E. Pillsbury, Boston; David L. Daniels, manager; Charles H. V. Smith; Arthur W. Howison, clerk and treasurer.

The town of Marble, Gunnison county, Col., has been incorporated. There are rich marble deposits there which were formerly worked.

C. A. Nims, of Harbor Beach, has been elected president of the United States Marble Company, of Spokane, Wash.

Messrs. Becke & Wilson, monument dealers, of Muscatine, Ia., have moved their works to 217 West Second street, in that city.

Darwin E. Hand has purchased the marble works of John Baumgardner, at Ann Arbor, Mich.

O. B. Walter and W. W. Hodges have opened a marble works at Durand, Mich.

John Blethen, director of the Rodwell Granite Company, and superintendent of the quarries, is dead at the age of 56 years.

The St. Louis Globe-Democrat says: "The granite streets of the city are in fairly good condition, and remain so rather from the indestructible nature of the paving than any care they receive. They were built along many of the downtown streets, where there is much heavy hauling. The district which they were to cover included most of the streets east of Jefferson avenue. After the work was well under way it was stopped by protests, and many

of the streets were paved with macadam, a cheap substitute, which is costing the city hundreds of thousands of dollars, yet it is not in passable condition. The brick streets of the city are also in fair condition, although they are all so young that no conclusions can be drawn from them. There are few brick streets here over three years old, and many of them are but two years old. The contractors have been forced to repair them repeatedly before they were finally accepted by the city."

Mr. Henry Jansen has opened marble works at 425 West Second street, Davenport, Ia. For the past ten or twelve years Mr. Jansen has been with the firm of Schrieker & Rodler.

Work has been resumed at Dix Island, Me., and the force is to be increased at once to 1,000 men. R. L. Fogg is superintendent for the government, and D. H. Smith looks after the interests of the granite company.

The Harrison Granite Company will sell out its property at Adrian, Mich., and move the executive offices to New York.

South Rygate is to have another granite firm. Will Darling and Ed. Metcalf are to form a partnership, and will have the rear of the Brock Granite Company's sheds.

The Concord (N. H.) "Monitor" says: "The New England Granite Works has sublet its contract for the foundations of the Currier tomb in Canaan to a young woman of that town who was in this city yesterday purchasing dynamite and other supplies for the work."

Minerals in Sweden.

The wealth of minerals in North Sweden does not yet by any means seem to have been fully ascertained, and fresh discoveries of deposits are of no uncommon occurrence. In some instances, such deposits have been known, and perhaps even worked in days gone by, but the working has, from some cause or other, been discontinued. This is understood to be the case with some iron ore deposits at Grufberget, close to Boden, North Sweden, in spite of the ore being right at the surface, as is the case with some of the vast deposits in that part of Sweden, and perhaps also with some copper ore deposits at Snarkölen, which are also said to promise well. Claims have now been lodged in both these deposits, where rational exploitation is likely soon to commence.

Limestone and Sandstone.

Mrs. Lila Stages has brought suit for \$10,000 against the Consolidated Stone Company, of Bloomington, Ind., for the death of her husband, who was killed by an accident in defendant's quarry.

North Bedford, Ind., is putting down new stone walks.

The old Cross Opera House, at Bedford, Ind., has been remodeled and opened as an inn. It is a unique building. The entrance is by way of a fine rustic stone porch made entirely of Bedford stone. Handsome stone settees are conveniently located in different places on this porch or veranda. They too are carved from designs in stone. On one side of the door is a life-size boy holding a basket of flowers. On the other side sits a like figure of a girl. Both of these are fine specimens of the artistic in stone. The interior is finished after the same style, everything being made of stone, where possible. The large tables, counters, wash-stands and wash-bowls are made of stone, and the fine pictures that adorn the walls—copies of the old masters—are done in Bedford stone. They expect to put in a large stone cold storage room, in which will be kept all the meats, fruit, etc.

New York is to have another magnificent building of Bedford stone. Plans have been filed for a new store for the dry goods house of Simpson, Crawford & Simpson on the west side of Sixth avenue, extending from Nineteenth to Twentieth streets. The building will be seven stories high, of fireproof construction, with an additional story rising above its central part, and will have a frontage on the avenue of 184 ft., and a depth of 253 ft. 8 in. The structure will be built in sections. The cost of the building is estimated at \$1,800,000. There will be much fine stone carving on the building.

A new stone passenger and freight depot is to be built at Seymour by the Southern Indiana Railway Company.

The Portland, Me., "Express" says: "Following the recent important lime rock deal in the transfer of the Blacking-

ton Farm quarry to Wm. T. Cobb, comes the sale of another valuable quarry plant of three quarries at Rockland, owned by Mr. and Mrs. F. T. Ulmer, to Mr. Cobb. The terms are private, but the property is a valuable one. Operations in the Ulmer quarries have practically been at a standstill for some years past, but under the management of the new owners the process of development will be actively renewed."

The Illinois Stone Company's quarries at Lemont have been closed and it is uncertain when they will open again.

The Hall stone quarry at Findley, O., has been pumped out and work resumed.

The stockholders of the Chippewa Sand & Stone Company, recently incorporated under the laws of West Virginia, with a capital stock of \$126,000, met in Massillon and elected the following directors: W. B. Humberger, F. O. Humberger, H. W. Loeffler, John Ross McCulloch, of Ft. Wayne, and James W. Warwick, of Cleveland. The board then organized with W. B. Humberger, president; J. W. Warwick, vice-president; F. O. Humberger, treasurer; H. W. Loeffler, secretary and manager. J. E. Ruch, of Clinton, formerly of Massillon, was elected superintendent of quarries. The Chippewa Company's quarries are near Warwick. The office is in Massillon, and it also has a stone yard in that city. Messrs. Loeffler and Ruch have been working the quarries for a year past, and the reorganization of the company was for the purpose of allowing the work to be carried on more extensively.

The Oakalla stone quarry at Greencastle, Ind., has been sold at auction to Riley Keen, of Terre Haute, for \$3,800.

The old stone quarry on the river bank at Wakeman, O., has been reopened and is being worked.

The Frank Carlucci Stone Company, of Fort Wayne, Ind., has been awarded the contract for furnishing dressed stone to be used in the erection of the new immigrant station on Ellis Island, N. Y. The dimensions of the building will be 163 by

384 feet and of a high architectural type. The stone will be of the buff variety. The lease on the property, which belongs to the Wabash railroad, has been renewed and this contract will furnish employment for a large number of men.

The Oliver quarries, near Nebraska City, Neb., have been opened up. They produce a buff sandstone.

The Michigan Alkali Company, of Wyandotte, has opened up a limestone quarry at Bellevue, Mich. It is said to be one of the best equipped quarries in the country.

Messrs. Garthright & DeBerry, of Terra Alta, W. Va., have purchased a large tract of heavily timbered land near that place. They are now cutting the timber. Underlying the tract is a vast deposit of excellent limestone which will soon be developed.

The Bevan Sandstone Company has been incorporated to develop stone quarries in Oregon, and to construct buildings. Incorporators: Sam Simon, F. A. Bancroft, A. T. Huggins; capital, \$5,000.

The Lemont Limestone Company will open a yard in Chicago.

Irish natural stone has long been celebrated for the qualities of beauty and durability. The institutions and principal houses of any age in Dublin are a lasting monument to the products of the quarries of the Dublin and Wicklow mountains. What brick work can compare with the houses in Cork, erected in the early part of the century with stone brought up in barges from the once famous quarries, now lying practically idle, behind Monkstown. For ornamental fronts, for public institutions, churches, and mansions, cut limestone is the most effective. Limestone is largely used by builders in Dublin, and a good deal of the stone comes ready dressed from Kilkenny.

Ingalls & Co., of Binghamton, N. Y., have the contract for supplying the Warsaw rockface bluestone that will be used for the windmill and water tower in Clemson Park, Middletown, N. Y.

Mrs. Anna Hartshorn, of Danbury, Ohio, has sold 65 acres of valuable quarry land in Danbury township to the Kelley Island Lime & Transportation Company. The land lies along the bay shore and contains the quarry lately operated by Joseph Fellerath. There is an inexhaustible supply of fine white limestone. The

vein is thick and any length or thickness can be obtained.

The new Trinity church at Scranton, Pa., is to be built of Cleveland blue Amherst stone, with Pottstown red sandstone for trimmings.

The celebrated Indian Spring, in Indiana, has been purchased by the Southern Indiana Railway Company, of which Mr. John R. Walsh is president. The old hotel at the Springs has been torn down, and a magnificent new one of stone, 400 by 350 feet, will be erected, according to press reports. Mr. Walsh is also president of the Bedford Quarries Company.

The Passaic Quarry Company, whose New York offices are at 38 Park Row, is just completing the installation on its quarry premises on the banks of the Passaic River, at Avondale, N. J., of a large up-to-date plant of steam stone cutting and dressing machinery. This will be the first time in the history of the famous Belleville stone that it will be cut and dressed on the premises from which it is quarried. The cutting plant is situated about 1,000 feet from the quarries, and stone will be delivered from the latter to the former by a gravity road. The equipment will permit the dressing of platforms as large as seven feet wide and fourteen feet long. The quarry premises are 24 acres in extent, run down to the Passaic River, and are only 13 miles from the center of Greater New York. From the quarries are taken two varieties of the Belleville stone, one a bright gray and the other a rich brown. Belleville stone has been in use for more than a hundred years, and slabs that have been exposed all of that time, as in the case of cemetery stones, have been found to weather without scaling or disintegration. The Passaic Quarries Company has issued an attractive little handbook showing what it has done in the past and what it proposes to do in the future.

A heavy vein of limestone has been struck at Marshall, Mich., and it may be developed.

The Malone Stone Company, of Amherst, Ohio, has received so many orders and has found workmen so scarce that it is compelled to work twelve hours a day.

Suit has been brought against the Mussey Stone Company, by the Ely heirs, for the possession of land adjacent to the quarries near Wellington, Ohio.



The Slate Trade



The general condition in the slate business continues satisfactory. Unfavorable weather has slightly retarded work, an unfortunate fact when the demand for stock is so brisk. July shipments, both from Pennsylvania and Vermont, were larger than the previous month. This is largely for the home market. Export is somewhat limited by the small stock on hand at the quarries.

"The Engineering and Mining Journal" says: "The demand for Welsh slates in most districts continues good, though the labor troubles in the building trades throughout England are being seriously felt by quarrymen. Shipments of slates from Carnarvon, Wales, in May amounted to 7,366 long tons, against 8,071 tons a year ago, and 7,157 tons in April, 1899. Some discussion took place at the last half-yearly conference of the National Association of Slate Merchants and Slaters in Great Britain regarding the importation of American slates. Among other things the slate merchants of Great Britain enter into an agreement to discontinue the importation of American slates as soon as those importations seriously interfere with the home industry. On the other hand, however, he stated that a considerable source of profit has been sacrificed by many merchants who did not import American slates, because they wished to protect the home industry. The president also said that the trade in American slates has been thus largely diverted to firms of mushroom growth in the slate trade. The exports of slate from the United States in June amounted to \$89,703, against \$132,006 in the same month last year. For the six months ending June 30th, 1899, the exports aggregated \$678,806, as compared with \$678,333 in the same time last year, and \$464,560 in 1897. For the fiscal year ending June 30th, 1899, the total exports were \$1,363,617, against \$1,370,075 in the previous year, and \$780,112 in 1897-98."

It is now proposed to mix slate rubbish with limestone in making cement.

The Consolidated Lehigh Slate Co. contemplates erecting a large new factory for the purpose of sawing blackboards, mantle stock, etc., on the premises belonging to them.

The Albion Slate Company, of Pen Argyl, is removing the top all along the northeastern part of its quarry, in order to prevent another slide.

An execution for \$30,269.20 has been issued to Christian Flory, of Bangor, trustee of the bondholders of the Danielsville Slate Company vs. the Danielsville Slate Company, with notice, to Samuel May terre tenant. The sheriff has levied upon the slate quarry of the defendants at Danielsville, Lehigh township.

The Park Slate Company, operating the quarry and factory of the Wind Gap Slate Manufacturing Co., are now producing 1,000 feet of blackboards and mill stock daily.

The Grand Central Slate Company, of Pen Argyl, are using a new channeler, designed by Hiram Sandt, one of the company. It is specially constructed for quarrying blackboard material.

Quintus Sandt & Co., who leased the Blair property at Pen Argyl recently, have shipped their first carload of slate.

J. C. Donahue's new quarry, at Northfield, Vt., is showing a fine grade of slate, and the vein seems to be an exceptionally good one. A movement is on foot to form a syndicate and buy it. Mr. Donahue will sell only the quarrying right.

The old Bangor Slate Company, whose quarries are located at Bangor, have resumed operations, having been idle since last September, when the men went on a strike against a ten per cent. reduction in their wages. The quarry has been leased by J. S. Moyer & Co., who have arranged a scale of wages satisfactory to the employees.

A number of Western men have leased the White Oak quarry, near Edelmans, Pa., and are operating it. If results are satisfactory they may buy the property.

At the annual meeting of the Fair Haven Marble and Marbleizing Slate company the following board of directors was elected: Charles R. Allen, Ira R. Allen, Frank E. Allen, G. H. Shinville and F. A. Town. The officers of the corporation are as follows: President, Charles R. Allen; secretary, treasurer and general manager, Geo. H. Shinville.

John Lewis, of West Castleton, Vt., was badly injured by a fall of stock in the Riverside mill.

Martin Maley, of Fair Haven, Vt., has for years made a specialty of manufacturing chess boards of slate. The effect is very odd and artistic.

Mr. Fred C. Davis, of London, Eng., visited the Fair Haven quarries and purchased over 3,000 squares of slate. Of the purchases 22 carloads were bought of R. E. Lloyd, 12 carloads of E. E. Lloyd and eight carloads of Minogue & Greer.

A premature explosion at the Meadow slate quarry, Fair Haven, badly injured two of the quarrymen.

Curtis Brader, of Slatedale, and Charles M. Neff, of Lehigh Furnace, were killed by a fall of debris in the quarry of the Consolidated Lehigh Slate Co., at Slatedale, Pa.

Fair Haven Correspondence.

Hydeville, Vt., Aug. 12.

The death of Patrick Holleran removes from our midst one of the oldest and first slatemakers of this neighborhood. Mr. Holleran and his brother, Matthew Holleran, were the first to make slate in Vermont, they being employed by Col. Alanson Allen in the old Proctor quarry.

Elroy Maynard, for some years in the employ of the Fair Haven Marble and Marbleized Slate Co., has been secured by the American Slate and Marble Co. Mr. Maynard being a skilled workman the A. S. M. Co. are to be congratulated on their acquisition.

Fair Haven was the scene of a sad accident during the past week. As Mr. Douglass Allen, in company with some of his workmen, were driving across what is known as the "Eddy crossing" they were struck by a freight train. One of the young men was instantly killed, and Mr. Allen was so seriously injured that he survived only about two hours. Mr. Allen

was about 60 years of age, being a son of the "old Colonel" Alanson Allen. Mr. Douglass Allen was at the time of his death a manufacturer of brick, but he had been heretofore interested in slate quarries, and quarry lands.

The Evergreen slate quarries, formerly owned by Ainsworth & Cole, but of late years by Minogue & Greer, have closed down, the quarry being worked out as far as the present proprietors' lease runs.

The New England Marbleized Slate Mantel Co., report trade as brisk, they having an unusual amount of orders for this time of the year. Their export trade is increasing, which speaks well for the quality of their work.

The Fair Haven Marbleized Slate Mantel Co., are making a specialty of finished laundry tubs and sinks, and every kind of construction work which entails the use of slate. They report trade as good.

G. B. BENFORD.

Copper Deposits of Bolivia.

According to the "Society of Arts Journal," the Bolivian copper formations extend in an almost uninterrupted line from south to north, following the general direction of the eastern chain of the Andes. The only beds worked to-day are those of Corocoro, upon the high plateau of Titicaca, and their distinctive feature is the abundance of native copper, in forms varying from microscopic grains to great masses weighing several tons; in wealth they are believed to rank second only to those of Lake Superior. The most primitive methods are employed, and the scarcity of fuel does not permit fusion on a large scale of the various combinations of the metal. There are only two furnaces at Corocoro, and the ore is broken with hammers by women, passed through mills worked by hand or by hydraulic power, undergoes two washings in inclined trenches, and finally is dried either by the sun or by artificial heat. The ore produced is of a standard of not less than 70 per cent. The quantity extracted in 1897 is reported as 6,421,000 pounds. The Bolivian government taxes every Spanish quintal (101 pounds) of ore about nine cents. The net cost of Spanish quintal of copper at Corocoro is about 24 cents.

Limes and Cements

The Lagarde Lime & Stone Company, of Gadsden, Ala., has been incorporated with a capital of \$50,000. The company has purchased valuable limestone property in Etowah county and begun the erection of a large lime plant and stone crusher to manufacture flux stone, high-grade lime and calcium carbide. The company is composed of John B. Lagarde, H. S. Crozier, L. D. Lagarde and John T. Gibbons, of New Orleans, La., and J. G. and J. A. Blount, of Gadsden.

A convention of lime manufacturers of Illinois and Missouri was held recently at Hannibal, Mo., for the purpose of taking initial steps towards the adjustment of freight rates. The following were present: The Gem City Lime Company, of Quincy, Ill., represented by Mr. Newton; The Menke Lime Company, of Quincy, represented by Mr. Menke; The Marblehead Lime Company, of Marblehead, Ill., represented by Mr. House; The Cook & Meyer Lime Company, of Quincy, represented by Messrs. Cook and Meyer; The Martin Lime Association, of Kansas City, represented by Mr. Hill; The Hannibal Lime Company, represented by Messrs. L. P. Munger and John Jones; The Waller Lime Company, of Hannibal, represented by W. D. Waller; The Star Lime Company, of Hannibal, represented by J. E. Priest; and The Empire Lime Company, of Hannibal, represented by Messrs. B. E. Hixson and H. B. Thompson.

Charles Herkel has sued the Toledo White Lime Company for \$25,000 damages for personal injuries received in December last at Clay Center, Ottawa county, O., from an explosion of dynamite in a quarry.

The Western Lime Association has decided to go into the co-operation business, although definite plans have not yet been adopted.

Daum & Son, of Carey, O., are very busy at their lime kilns, their business being one of the leading industries of the town.

Westphal Bros., of New London, Wis., have erected a new patent draw kiln and

are producing over 100 barrels of lime a day.

The Anniston (Ala.) Lime & Stone Company's lime works were burned.

The Darby Mortar Company is erecting a 30x100 feet building at Media, Pa., for a ready-mixed mortar plant.

The Palmyra (Tenn.) Lime Company is putting in an extensive stave factory.

The Alabama Coal & Iron Company, with headquarters at Birmingham, will put up a large quarrying and stone-crushing plant at Rock Springs, twenty miles north of Anniston. A large stone crusher is to be erected with a daily capacity sufficient to furnish the iron furnaces at Clifton, Shelby and Gadsden, and if necessary, the one furnace now owned by the Alabama Coal & Iron Company at Birmingham.

The Illinois Central Railroad is putting down 2,500 square feet of cement platform at the Waterloo, Ia., depot. Six inches of crushed rock forms the foundation.

A recent despatch from Nacogdoches, Texas, stated that all building at that place was suspended owing to a lime famine. Lime is procured from Austin, Dallas or some neighboring point.

The Seattle & Roche Harbor Lime Co., of Seattle, Wash., has been incorporated with a capital of \$100,000.

The Chicago papers declare that the first bit of scandal in connection with the building of the famous drainage canal has just cropped out. The "Times-Herald" says: "Facts have recently come into possession of the drainage board which tend to show that unfair means were used in connection with the construction of the dam at Joliet. Tests which have been made of the cement used prove that it is not up to the requirements and that the board will have to expend from \$10,000 to \$12,000 to rebuild the portion which has been completed. The cement was passed by Cement Tester Herbert E. La Dow as up to the specifications called for in the contract. For several days La Dow has been subjected to a rigid examination by various members of the

board and has practically admitted that he falsified the reports of tests made. He denies, however, that he was bribed in the matter, and asserts that he simply wanted to 'be a good fellow.' La Dow has been removed from his position and is now threatened with arrest. It is estimated that fully 1,000 barrels of the cement has gone into the work." The canal has so far cost the taxpayers nearly \$33,000,000, and even if this charge proves to be true, the record will prove pretty good for a municipal job.

The Omega Portland Cement Company, of Jonesville, Mich., has been incorporated by S. B. Collins, L. J. Byers, O. F. Jordan, and others. Capital stock, \$300,000.

A syndicate has purchased a tract of 100 acres of land at Strasburg Junction, Va., and will at once begin the erection of a cement plant, there being extensive deposits of cement there. Two hundred men will be employed. The syndicate is composed of business men of Lynchburg.

The large lime works of the Anniston Lime and Stone Company at Cobb City, Ala., have been destroyed. The loss is many thousands of dollars and it is only partly covered by insurance. The plant will be rebuilt at once.

Fire, entailing a loss of about \$250,000, destroyed the works of the Glens Falls, N. Y., Portland Cement Company.

Ancient Cement.

Samples of cement used in the antique water conduits about Ephesus and Smyrna were recently subjected to chemical analysis, and the results have proved interesting from the archaeological as well as the engineering point of view. While the different samples were from water works that dated from several centuries before Christ to 300 years after, yet it was found that the general composition of all was quite similar. The chief constituent was carbonate of lime, but mixed with it was from 2 to 8 per cent. of organic material. This was ascertained to consist of a mixture of fatty acids, and it is believed that the cement was the kind which Pliny and Vitruvius mention in their works. Experiments were made with a cement consisting of burned lime and olive or linseed oil, but it was not found to be permanent.

On the other hand, a mixture of two-thirds air-slaked lime and one-third olive oil hardened readily, and possessed great endurance, leading to the belief that this was the composition of the ancient cements which were analyzed.

Cement Deterioration.

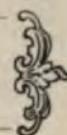
Attention has recently been drawn to peculiar cases of comparatively rapid cement deterioration under obscure conditions. Thus, Stutzer and Hartleb report a case of a reservoir which, within three years, became covered with a soft brownish mud, while the concrete underneath proved permeable. On analysis it was found that silica, iron, and alumina seemed to have increased in proportion, whilst the percentage of lime had decreased. Evidently some lime had been dissolved, so that the percentage of the other constituents was apparently augmented. In some cases this would be ascribed to the action of carbonic acid. Exhalations of this gas are common in the Rhenish district, where some of these deteriorations have also occurred. In other instances, any action of carbonic dioxide looked improbable; and, no other cause being traced, the suggestion of some bacteriological activity did not appear altogether absurd. In one of these cases ammonium sulphate was added to the water. It was gradually transformed into nitrite, all ammonia disappeared, and nitrite of calcium—a readily soluble compound—was formed. A microbe was also discovered; it would have been strange, indeed, if the microbe had been missing. We cannot inoculate our cement against microbes, and the idea of cement microbes is not very pleasant for hydraulic engineers. But it is reassuring, on the other hand, that one cement was cured by adding more silica. Perhaps the microbes are not over-fond of sand.

Victorium.

Information is given by Sir William Crookes of the discovery of what he believed to be a new element. In his work on the fractionation of yttria, he found in a photograph of a spectrum not visible to the eye a group of lines indicating a new element. Its atomic weight is probably near 117.



Monumental News



The design of the Harrison Granite Company, of Barre, has been accepted for the Battle Creek, Mich., soldiers' monument. It will consist of a shaft 35 feet high, with a base 10 feet 6 inches square, and a bronze group entitled "Defense of the Flag." The cost will be \$6,500.

Chicago is endeavoring to get a replica of the bronze statue of Washington by Daniel French and Edward Potter, which the Colonial Dames will present to the Paris Exposition.

German societies in Chicago are raising a fund for a Goethe statue for that city.

Funds are being raised at Ephrata, Pa., for a monument to the Revolutionary soldiers who died there from wounds received at the battle of the Brandywine.

Boone, Ia., is talking of a general tax levy to raise \$4,000 for a soldiers' monument.

Sculptor Henry F. Plasschaert has brought suit in the Philadelphia Common Pleas Court against the Pennsylvania Monument Association to recover a balance of \$94 claimed to be due for work done in making a group of soldiers and two bas-relief panels, which were cast and modeled in plaster for the defendant company.

Efforts are being made to raise a fund of \$20,000 for a monument to the late Governor Roswell P. Flower at Watertown, N. Y. A third of the sum has already been secured.

A bronze statue eight feet six inches in height of Rear Admiral Raphael Semmes, of the Confederate navy, will be erected at Mobile.

Confederate camps and the Daughters of the Confederacy are trying to raise \$10,000 for a monument to Gen. Nathan B. Forrest at Chattanooga.

Waukegan, Ill., will dedicate its soldiers' monument on August 30.

Red Wing, Minn., has raised nearly half the necessary amount for a \$3,000 soldiers' monument.

It is believed that Vermont's tribute

to Dewey will take the form of a statue to be placed opposite the Ethan Allen statue at the State House entrance. It will probably be designed by Larkin G. Mead, another son of Vermont, who made the Allen statue.

The leading British societies of Boston talk of erecting a monument to the British soldiers, 224 in number, who were killed in the battle of Bunker Hill.

A monument to the unknown dead who fell in the civil war is being erected at Peoria, Ill. The contract has been let to Triebel & Sons, of that city.

On May 31, 1901, a statue to General Albert Pike, late Grand Commander of the Scottish Rite Masons, will be unveiled in Washington. Sculptor Gaetano Trentanove of Washington, is in Italy at work on the statue, which will be mounted on a pedestal of Italian marble. Besides the statue of Gen. Pike there will be a bronze figure of a woman, representing peace, charity and fraternity.

The Ingersoll Monument Association has been incorporated at Peoria, Ill., to erect a monument in that city to the dead agnostic.

An odd monument was desired by an elderly maiden lady who died a few weeks ago in Athlone, Ireland. She left a fortune of £27,000 to be spent in the erection of a church, provided that her body should be converted into ashes and used in making the mortar for building the edifice.

Ohio Camp of United Confederate Veterans is taking steps for the erection of a \$10,000 monument to the 2,260 Confederate soldiers buried at Camp Chase, near Columbus, O.

Geneva, Neb., has raised over \$1,000 towards a soldiers' monument.

Pensacola, Fla., has raised \$3,000 by public subscription for a monument to the late Col. W. D. Chipley.

Sculptor George Julian Zolnay, of New York, has completed the modeling of a statue of Jefferson Davis, that will be

STONE.

erected in Hollywood Cemetery, Richmond.

To erect a memorial fountain in honor of the memory of the late Rev. Dr. Southgate, Annapolis citizens are being solicited for a \$2,500 fund.

Connecticut will erect a \$1,500 monument to the memory of Gen. Mansfield on the Antietam battlefield.

Frank Teich, of San Antonio, is the contractor for the Confederate monument to be erected in front of the State Capitol at Austin, Texas.

The North Redwood, Minn., Granite Works has been awarded the contract for the shaft to be erected by the Minnesota Valley Historical Society near Morton in memory of the Indians, who were faithful to the whites in the Sioux massacre of 1862.

While Michael Angelo's marble relief of Leda, in the Bargello palace at Florence, was being taken down for some slight repairs it slipped and was broken to pieces. It is hoped to be able to stick the pieces together again so that the joints will not show.

The Milford, N. H., Granite Company is completing a \$30,000 monument for the late Mr. Griesdieck of St. Louis, Mo. It consists of eleven pieces, the smallest weighing about 6 tons and the largest 18 tons. The height when completed is 32 feet. One artistic embellishment is a life-size bust of Mr. Griesdieck which is set in an alcove. This bust bears the stamp of Modeller and Sculptor King. The company has entirely rebuilt and refurnished its office.

A monument recently placed in a cemetery in Louisville, Ky., bears inscriptions to the memory of James Austin, a soldier of the Revolution; James Allen Austin, his son, a soldier in the War of 1812; James Grigsby Austin, his grandson, a soldier of the war with Mexico, and James Richard Gathright, his great-grandson, a confederate soldier, who was killed at Murfreesboro, Tenn., Jan. 1, 1863. All were privates.

Carl Bitter's statue of the late Dr. William Pepper, for the University of Pennsylvania, has been completed.

A memorial of the late Mgr. Bourget, second bishop of Montreal, will be erected in that city at a cost of \$6,000. It will

probably be designed by Mr. Hebert, the well-known Canadian sculptor.

Columbus, Neb., will have a \$2,500 soldiers' monument.

Oregon people talk of using the fund raised for a welcome to the returning volunteers, in case a reception is found impracticable, for a monument.

Springfield, Mo., talks of a Confederate monument.

The Grant Marble Works, of South Dakota, is putting up a monument for an Indian, and the inscription will be cut on the stone in the Indian dialect.

Virden, Ill., will have a soldiers' monument.

Toledo, O., has \$1,600 in hand for a soldiers' monument.

Henry J. Ellicott, the Washington sculptor, has been chosen to make a life-size statue of the late Senator Zebulon B. Vance for Raleigh, N. C.

E. M. Backus, of Minneapolis, has sailed for Manoas, Brazil, where he will personally superintend the construction of a granite monument, the contract for which was secured by the Maine and Vermont Granite Company. Manoas is a city of about 40,000 inhabitants and is located at a point about 1,000 miles from the mouth of the Amazon river.

Two Rivers, Wis., is raising a fund for a soldiers' monument.

Governor Lowndes, of Maryland, has decided to appoint Gen. Thos. J. Shryock, Ex-Governor John Lee Carroll, Douglas H. Thomas, Judge Charles E. Phelps and Dr. Favian Franklin as the statuary commission to select the designs for the statues of Charles Carroll, of Carrollton, and John Hanson to be placed in the Statuary Hall of the Capitol at Washington.

Mr. W. E. Hill has purchased the marble and granite business of H. Hutchcraft, at Benton, Ill.

Charles H. Nichaus, the New York sculptor, has completed the statue of Oliver P. Morton, which Indiana will erect in Statuary Hall, at Washington.

The Peterson Granite Company, of St. Paul, Minn., has been awarded a contract by the John Brown Memorial Association for a monument to the Ossawatomie hero.

A life-sized figure of a Union soldier is being cut from Bedford stone for a soldier's monument at Winnebago, Wis.

Contracts and Building

Government Work.

Buffalo, N. Y.—Bids will be received by James Knox Taylor, supervising architect, Washington, for the interior finishing, plumbing and approaches in the United States Postoffice, at Buffalo.

League Island, Pa.—Proposals will be received at the Bureau of Yards and Docks, Navy Department, Washington, until Sept. 2, for the construction of a workhouse and boiler-house for ordnance, Navy Yard, League Island. Plans can be obtained of the Commandant in charge.

Newport, Ky.—Bids will be received by James Knox Taylor, Supervising Architect, Washington, until Aug. 31, for construction of the United States Postoffice building at Newport. Plans can be seen at the office of the architect or at the office of the Postmaster at Newport.

Phoenix, Ariz.—Bids will be received at the office of Indian affairs, Department of the Interior, Washington, until September 5, for the erection of a brick manual training building at the Phoenix Indian Industrial School. Address Superintendent, S. N. McCowan, Phoenix, Ariz.

Portsmouth, N. H.—Bids will be received at the Bureau of Yards and Docks, Navy Department, Washington, until September 2, for the construction of an electric light building and a boiler room at the Portsmouth Navy Yard. Address Mordecai T. Endicott.

St. Paul, Minn.—The date for the opening of bids for the extension to the United States Postoffice at St. Paul has been extended until August 30.

San Francisco, Cal.—Proposals will be received at the Bureau of Navigation, Navy Department, Washington, until August 30 for the construction of a building for officers' quarters for the United States Naval Training Station, on Yerba Buena Island. F. W. Dickens, Acting Chief of Bureau.

West Point, N. Y.—Bids will be received until September 4 for the reconstruction and remodeling of the Library Building, which will be made entirely of fire proof.

Address Quartermaster, U. S. M. A., West Point.

Hotels, Theatres, Depots, County Buildings, Etc.

Antigo, Wis.—H. J. Van Ryn, of Milwaukee, is preparing plans for a \$20,000 hotel to be erected by J. H. Frances.

Atlanta, Ga.—The State Railroad Commission has brought the railroads centering in Atlanta to time in their evasion of the order to build a passenger station adequate to the needs of Atlanta by ordering them each to build a separate station.

Auburn, Neb.—Bids will be received by the Board of Commissioners of Nemaha County, August 30, for the erection of a court house in accordance with plans prepared by Geo. A. Berlinghof.

Battle Creek, Mich.—The Postum Cereal Company will expend \$125,000 to \$150,000 in building a stone and brick hotel, two business blocks of modern construction, and an asphalt paved street in front of one block and the hotel.

Chippewa Falls, Wis.—The Wisconsin Central Railroad will build a new depot at this place.

Clybourne Junction, Ill.—Frost & Granger, of Chicago, have prepared plans for a \$12,000 depot to be erected by the C. & N. W. Railway.

Coffeeville, Miss.—The Illinois Central Railway will erect a passenger and freight depot at this place.

Columbia City, Ind.—Plans have been prepared by Wing & Mahuring, of Fort Wayne, for a proposed Masonic Temple and opera house.

Columbia, S. C.—The city council will reopen the matter of receiving bids for new city hall. The cost has been increased from \$25,000 to \$40,000.

Cripple Creek, Colo.—The Florence & Cripple Creek Railway Company will erect a \$65,000 depot here.

Des Moines, Ia.—H. B. Hansen is planning a fifty-room addition to the Imperial Hotel. Estimated cost, \$40,000.

Duluth, Minn.—E. P. Alexander and E. Z. Williams have purchased a site for building a theatre. The plans have not been decided upon.

Durand, Mich.—The new union depot here is to cost about \$40,000. It will be two stories high, stone to the first floor and brick above. A commodious train shed will cover the various tracks which meet at this point.

Findlay, Ohio.—The Opera House Company has been organized to build a \$60,000 opera house. The plans have been prepared by Geo. O. Garnsey, 217, 185 Dearborn street, Chicago.

Flint, Mich.—The Chicago and Grand Trunk Railway will build a new depot.

Hooperston, Ill.—A new \$20,000 union depot is to be erected here by the C. E. & I. and the L. E. & W. Railroad companies, providing the citizens buy and present these corporations a site.

Jackson, Mich.—Louis Kamper of Detroit, is preparing plans for a \$40,000 society building, to be erected by the Elks. Contracts are not awarded.

Knoxville, Tenn.—Baumann Bros. have prepared plans for the \$35,000 city hospital.

Many, La.—The police jury of Sabine parish has awarded contract for the erection of new court house to M. T. Lewman & Co., of Atlanta & Louisville, for \$17,000.

Meadville, Pa.—The Crawford County Commissioners will build a new jail at a cost of about \$25,000. It will be iron, brick and stone.

Mobile, Ala.—The new union depot to be erected by the Mobile Terminal Co. will be located on the west side of Commerce to cost \$300,000.

Nashville, Tenn.—Additions will be made to court house of Davidson county at an estimated cost of \$58,000. Rebent, architect.

New Orleans, La.—Architects are invited to submit plans and specifications for a Home for Incurables, to be erected in this city, and to cost not more than \$30,000. Miss Emma K. Walsh, 1808 Peters avenue, chairman building committee.

New York.—A new theatre will be built on W. 34th street, it is said, for George S. Krause and Senator T. J. Sullivan. It will extend through to 33d street.

Norfolk, Va.—Plans and estimates for a modern jail and police station are invited

by the city of Norfolk. R. E. Steed, secretary.

Oakland, Cal.—Landers Stevens is planning to build a theatre at a cost of \$28,000.

Pensacola, Fla.—An election will be called to vote on the question of issuing \$20,000 in bonds to build a city market and \$20,000 in bonds to build a city hall.

Rome, N. Y.—Proposals are wanted for building a ward building at the Rome State Custodial Asylum. Drawings and specifications can be seen at Rome, or at the office of G. L. Heins, State Architect, Albany, N. Y. John F. Fitzgerald, superintendent, Rome.

Rock Island, Ill. Fred Applequiet of Orion, Ill., proposes to erect a \$15,000 hotel on Third avenue.

The Rock Island Club have secured plans for the erection of a proposed theatre. Estimated cost \$70,000.

Terrell, Tex.—Herbert M. Green, Dallas, has prepared plans for an \$18,000 depot to be erected by the Texas & Pacific and the Texas Midland Railways.

Wausau, Wis.—A jail and sheriff's residence will be built after plans by the Pauley Building and Manufacturing Company, of St. Louis, Mo.

Weldon, Ill.—The Weldon Opera House Co. has been incorporated to build a \$45,000 opera house.

West Liberty, Ia.—The location has been staked out for a depot to be erected by the Chicago, Rock Island & Pacific Railway.

Schools, Colleges and Libraries.

Andover, Mass.—The money for the new gymnasium at the Phillips-Andover Academy, \$50,000, has been raised.

Dixon, Ill.—President Dodge, of the Grand De-Tour Plow Works, has given the city a site and \$20,000 for a library.

East Liverpool, O.—A site has been purchased for the library which Andrew Carnegie gave \$50,000.

Evanston, Ill.—New Frier township is to have a \$50,000 high school.

Flatbush, N. Y.—The Holy Cross Catholic Society will build a \$50,000 parochial school. Rev. J. T. Woods, pastor.

Flint, Mich.—An \$80,000 building will be erected for the school for the deaf.

Glen Ridge, N. J.—Ground has been broken for an \$80,000 school at Ridgewood and Bloomfield avenues.

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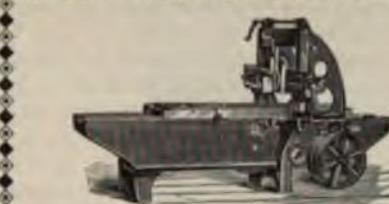
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Hurley, Wis.—The citizens voted to issue \$15,000 in bonds to build a school in Vaugh township, Iron County.

Louisville, Ohio.—Furnian & Ulrich, 80 Euclid avenue, Cleveland, have prepared plans for building a \$6,500 chapel and dormitory for the St. Louis Orphan Asylum. Sister M. Thomas, in charge.

North Adams, Mass.—The city council voted to appropriate \$55,000 for the purchase of land and the erection of a school house in Ward 3.

Philadelphia, Pa.—Architect Joseph L. Anschutz, of the Board of Education, is working on plans for a new public building at Germantown.

Rochester, N. Y.—The trustees of the Rochester University have decided to build a gymnasium, reception rooms, bowling alley, baths, etc.

Churches.

Berkley, Va.—Capt. E. M. Tilley, a capitalist, is to erect a \$20,000 stone church and present it to the congregation of the Chestnut Street Methodist Episcopal Church.

Cohasset, Mass.—Col. Albert A. Pope is to erect a memorial here to his son, Charles Linden Pope, in the shape of a \$40,000 church. Work will be begun at once. The church will be undenominational.

Cynthiana, Ky.—Plans are being prepared by Des Jardins & Haywood, of Cincinnati, for a \$15,000 church to be erected by the Christian Society.

Dayton, O.—Chas. Herby has prepared plans for a \$48,000 church to be erected by the St. John's German Luthern church.

De Soto, Mo.—The Congregational Society will commence the erection of a \$15,000 church soon.

Fort Worth, Tex.—The Broadway Presbyterian Society is planning to build a \$15,000 church. Rev. J. B. French, pastor.

Minneapolis, Minn.—St. Paul's Episcopal Society has decided to build a new church on Lowry Hill. Rev. F. T. Webb, rector.

Milwaukee, Wis.—The Christian Science Society has purchased a site on Prospect and Keen streets for \$20,000, for a new church. Chas. H. Clarke, reader.

Parkville, Conn.—The Parkville Methodist Episcopal church is having plans pre-

pared by Architect G. W. Buckland for a \$15,000 church.

Pewaukee, Wis.—Plans have been prepared by W. D. Kimball for building a stone church for St. Bartholomew Episcopal Society.

Architect W. L. Plack has prepared plans for a two-story stone church for the congregation of the Trinity Baptist Church to be erected at Poplar and Pennock Sts.

St. Louis, Mo.—A church to cost \$100,000 will be erected by St. Kelvin's parish. Plans for it have been prepared by Barnett, Haynes & Barnett. Rev. E. J. Shea.

Business Buildings.

Augusta, Ga.—Bruce & Morgan, of Atlanta, have prepared plans for a business building here to cost \$25,000.

Belton, S. C.—The Bank of Belton has been organized with a capital stock of \$50,000, and a new bank is to be erected with all modern conveniences. B. A. Lewis, president; W. E. Greer, cashier.

Chicago, Ill.—Bids are now being received for a \$60,000 brewery building to be erected at Albany avenue, near Fillmore, by the Gambrinus Brewing Company. Theo Lewandowski, 828 Schiller Building, architect.

Cordele, Ga.—J. T. Hill and J. T. Jones will erect a two-story brick business building, with granite front.

Covington, Ky.—Ball & Taylor, of Cincinnati, have prepared plans for a \$20,000 warehouse for the Cambridge Tile & Manufacturing Company.

Dallas, Tex.—Herbert M. Greene has prepared plans for a new building to cost \$55,000 for the "Morning News."

Detroit, Mich.—Col. F. J. Hecker will build a six-story business building of pressed brick and sandstone. Cost \$30,000. Donaldson & Meier, 89 Moffat building, architects.

Dubuque, Ia.—Thos. J. Carkeih is preparing plans for a bank building to be erected by the Second National.

Hoboken, N. J.—The Hudson Trust & Savings Institution, of this city, will erect a bank building on Newark and Hudson streets.

Louisville, Ky.—E. H. Ferguson will erect a \$75,000 office building.

Minneapolis, Minn.—Plans are being prepared for a \$100,000 mill and elevator to be erected by the Minnesota Transfer Co.

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It is a convenient machine for this and
similar work.

QUARRY ..BARS..

Norfolk, Va.—The Fidelity International Company has purchased site for a \$200,000 factory.

Norwood, Ohio.—The United States Playing Card Company, of Cincinnati, will build a \$150,000 factory after plans prepared by S. Hannaford & Sons, of Cincinnati.

Pittsburg, Pa.—L. Benz & Bros. have received the contract for erecting the building for the Duquesne Brewing Co. The contract for the building alone was \$200,000.

A restaurant building to cost about \$25,000 is to be erected in Highland Park by Senator C. L. Magee. The structure will conform with the handsome architecture of the other buildings.

Valparaiso, Ind.—W. D. Owen, ex-Secretary of State has purchased the interest of A. Baker, of Rochester, in the Garden City brick plant of this place. It is said that a syndicate has been formed by Mr. Owen who will enlarge the plant and manufacture terra cotta.

Bridges.

Baldwinsville, N. Y.—A \$32,000 steel bridge, 200 feet long, and 48 feet wide, will be built across the Seneca River.

Binghamton, N. Y.—The Railway Commissioners have under consideration the construction of a viaduct. Estimated cost, \$250,000.

California.—It is said that the State will undertake extensive work in the way of masonry bridge construction next spring.

Cincinnati, Ohio.—The Dearborn County Board of Commissioners and the Commissioners of Hamilton County will receive bids until September 2 for repairing the north abutment and north wall of the Harrison suspension bridge over Whitewater River.

The Board of County Commissioners will receive bids until Sept. 2 for the substructure of the bridge over the B. & O. S. W. R. R. on Montgomery Pike, in the village of Norwood.

Colusa, Cal.—The bids for a bridge over the Sacramento River have been rejected and new ones are asked for. The Colusa Stone Company offered to build the bridge and furnish all the material for \$41,900.

Indianapolis, Ind.—All of the bids for a bridge over Fall Creek, at Central avenue, were rejected because of defective advertis-

ing and new bids are asked. William Petrie gave a bid for a stone bridge at \$53,900; Hoosier Construction Co., Melan arch, \$32,000 and \$31,000; Oolitic limestone, \$32,600; M. M. Defrees, stone bridge, \$54,812; concrete arch, \$53,200. New bids will be received until Aug. 30.

Kankakee, Ill.—Plans and specifications are asked for the proposed bridge over the Kankakee River, the bridge to be either a concrete, stone or plate girder, 625 feet long, with a roadway 24 feet wide and an 8 foot cement sidewalk. R. G. Gregg, City Engineer.

Louisville, Ky.—A party of civil engineers have sounded for the new bridge that is to span Kentucky River about 300 yards above its mouth at Carrollton, and indications are that work on the structure will commence at once.

Manchester, N. Y.—Edson Bros., of Phelps, N. Y., have prepared plans for a stone arch bridge at this place with two spans each 40 feet long, and a driveway 20 feet wide.

Marshall, Mich.—Munaw & Briegel have been awarded the contract for a stone bridge across the Kalamazoo River, for \$4,205.

Muscatine, Ia.—Jas. H. Shelden has been awarded the contract for building the bridges and culverts for the entire line of the Davenport, Clinton & Eastern Railroad between Davenport and Clinton, the contract price being somewhere between \$25,000 and \$30,000. Work will be completed by November 1.

Sandusky, O.—Bids will be received until Aug. 29 for a bridge over the Vermillion River at Birmingham, Erie County. The entire length of the bridge and approaches will be 470 feet.

Shelbyville, Ind.—The Shelby County Board will receive bids August 28 for the construction of four county bridges.

Winona, Minn.—Only one bid was received for a stone arch bridge in the town of Warren, that of Harper & Gotz for \$1,450. This was rejected and new bids called for.

Plaster for Damp Walls.

Two coats of ordinary lime mortar are applied to the wall; the last coat is smoothed with a steel float. Upon this is applied a third coat of very fat lime, and this is glazed with pure lime compounded with some alumina and one-twentieth part of alum.

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Trade Notes



The Bowe Granite Company is a new concern that is starting in business at Albany, N. Y., under the most favorable auspices. The company was incorporated some months ago and the officers are John Bowe, president; Charles H. Sabin, vice-president; James MacN. Thompson, secretary and treasurer. All of these gentlemen are prominently and favorably known in Albany, where the main office of the company is located. The quarries are well equipped with modern machinery of every sort and are located in the Berkshire Hills five miles from Chester, Mass. A railroad spur from the Boston and Albany main track to the quarry was completed about July 25, so that shipping is now well under way. The works are at Chester, adjacent to the main line of the railroad. The stone in this quarry is a fine grained, evenly marked dark granite of excellent quality and it takes a fine polish. It is particularly suited for monumental work. The company has every facility for getting out vault, mausoleum, slab and veneer work. Mr. James Mitchell, who was for many years in charge of the stone cutting on the Albany capitol, is a representative of the company.

The Ingersoll-Sergeant Drill Company of the Havemeyer Building, New York, has issued a new and revised catalogue, No. 23, devoted to Air Compressors. While many of the tables in this are the same as those in the previous catalogue, there have been added illustrations of some very important plants and machines and there is also included an exhaustive series of formulas and tables on "The flow of air through pipes." The value of these to all engineers can readily be understood. It has been compiled with great care and at large expense. The company has had an experience of over twenty-five years in the manufacture of air compressors, and other appliances that have met with favor in every part of the world. The present catalogue is a mine of useful information.

No manufacturer of stone cutting, contractors, and masons' tools, enjoys a higher reputation than I. V. Mead, of 418 E. 110th street, New York City. His card will be found in another column. Mr. Mead makes a specialty of the manufacture of Bush Hammers, and he does repairing and sharpening in the best possible manner.

Portage Entry sandstone, one of the handsomest and best stones of its class to be found anywhere in the country, is to be used for a fine business block to be built by C. A. Wright, of Grand Rapids, on the site of the Superior Savings Bank, at Hancock, Mich.

During the past month preliminary steps have been taken in New York towards the organization of a company to develop the standstone quarries at Rawlins, Wyo., and the granite quarries at Cotopaxi, Colo. The sandstone is of a very even texture, of an excellent color, and is splendidly adapted for building purposes. It is also suited for grindstones. The granite is fine grained, free from iron, and of a faint pink tint. Both of the stones will make notable additions to the building material of the West. Mr. George W. Frank, of Kearney, Neb., has the matter in charge.

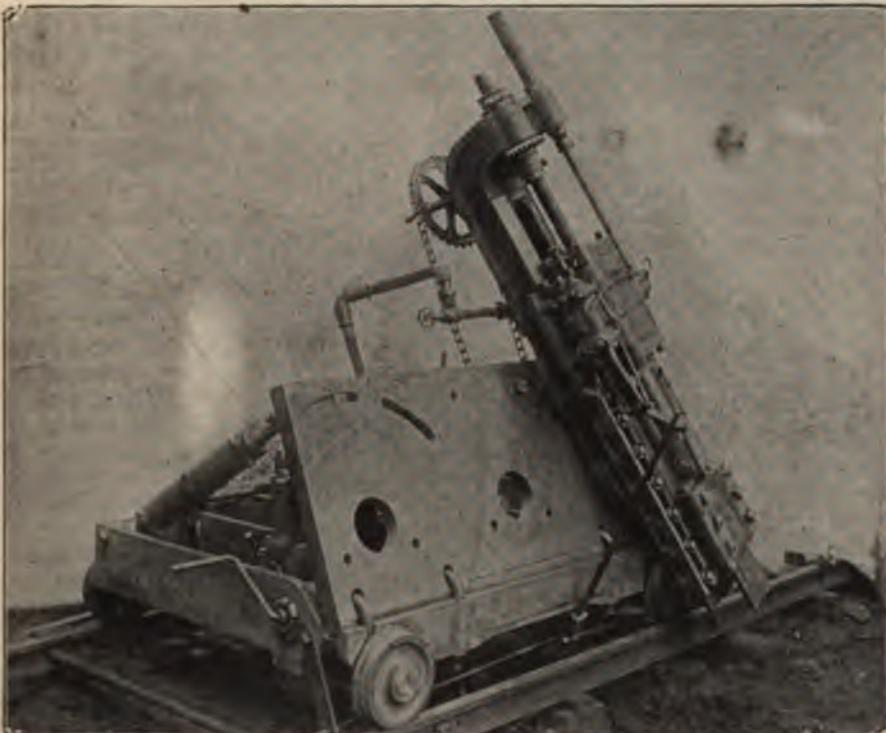
The latest catalogue of the Rand Drill Company, devoted to rock drill and drill mountings, is an excellent example of a business hand book. It is very attractively illustrated, and contains much besides the mere description and price list of the goods manufactured. The introduction is an interesting historical account of the development of rock drills written by Addison C. Rand, the president of the company, with very clever pictures showing the use of rock drills under Arctic skies and tropic suns. Another catalogue equally attractive is one devoted to air and gas compressors, manufactured by this firm. Both should be in the hands of every stone worker and quarryman.

We have received from the Sullivan Machinery Company, of Chicago, through

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Please mention STONE when writing to advertisers.

their New York office, at 71 Broadway, a copy of Catalogue No. 30, devoted to the Sullivan Rock Drills for mining, shaft sinking, tunneling, rock excavating and quarrying. This is a very interesting trade publication of nearly one hundred pages, profusely illustrated. Beside the famous rock drill, incidental mention is made of the other quarrying and stone working machinery manufactured by the company. The Sullivan drill has stood the most severe tests of time and usage, and has demonstrated its many merits. The valves are designed for either steam or air, and are "balanced" so that there is very little wear, thus allowing the whole power of the steam or air to be utilized for effective work, instead of being wasted in overcoming friction. The drill has very few parts in its construction, which is an important fact in the matter of repairs, and all of the parts are made perfectly interchangeable. The Sullivan quarry bar is another tool that is largely used in quarries in connection with the drill. This is also illustrated and described in the catalogue.

We have received a large and handsomely illustrated catalogue of 100 pages, issued by the S. Flory Manufacturing Company, of Bangor, Pa. This includes the latest and most improved designs in contractors' and mine hoisting engines, suspension cableways, tramways and conveying devices, dredging, excavating and logging machinery and slate mining and working machinery. The Flory machinery has been for many years on the market, and has made a firm place for itself in the regard of all who use appliances of this sort. The company adheres strictly to the duplicate part system, so that all breakages can be repaired in the shortest time and at minimum expense. The company makes a specialty of cableways and many of the largest quarries in the slate regions are equipped with its system. A number of these are illustrated in the catalogue.

Good Laws.

The States which have made the most progress in road building have enacted two or more of the following laws: A highway commission law, which places the supervision, construction and maintenance of all public roads in the State under a highway commission or department of

highways; a State aid law, which provides for the payment by the State of a certain per cent. of the cost of construction of all the principal improved roads, either in money or materials prepared by convict labor; a money tax law, which provides for the collection of all road-tax in money, and also for the construction of all roads by the contract system, leaving it optional with those who are not able to pay their tax in money to work out their time with the contractor; a convict or vagrant law, which provides for the use of convicts and vagrants in preparing road material in stockades or in building roads; a wide tire law, which compels or encourages the use of wide tires on all vehicles bearing heavy burdens.

New Brick and Tile Works.

Canton, N. J.—Canton & Osnabury Brick & Tile Co., capital stock \$100,000; R. W. Allison, Henry M. Keasbey and Geo. M. Keasbey, incorporators. Principal office, 765 Broad street, Newark, N. J.

Valparaiso, Ind.—Ex-Congressman W. D. Owen, of Indianapolis, bought the Garden City brick yards near Valparaiso. Owen represents a Cincinnati, Chicago and Indianapolis syndicate and the plant will be enlarged and the force doubled. Terra cotta will be manufactured.

The Corundum Industry.

While the corundum industry of India dates back to the earliest times, the abundant deposits of this mineral in the Eastern United States have only been worked during the last twenty years. Corundum deposits are known to occur all along the southern slopes of the Appalachian chain from New York State to Alabama, but it is extracted in a large scale only in Georgia and North Carolina. In 1878 it was found in North Carolina, and since that time its output has steadily increased. Corundum wheels are rapidly replacing files for grinding down metal surfaces and are taking the place of grindstones for sharpening tools. It costs about 60 cents to file down a pound weight of iron with an ordinary file, while a corundum wheel can do the same amount of work at one-seventh of the cost and in one-eighth of the time.

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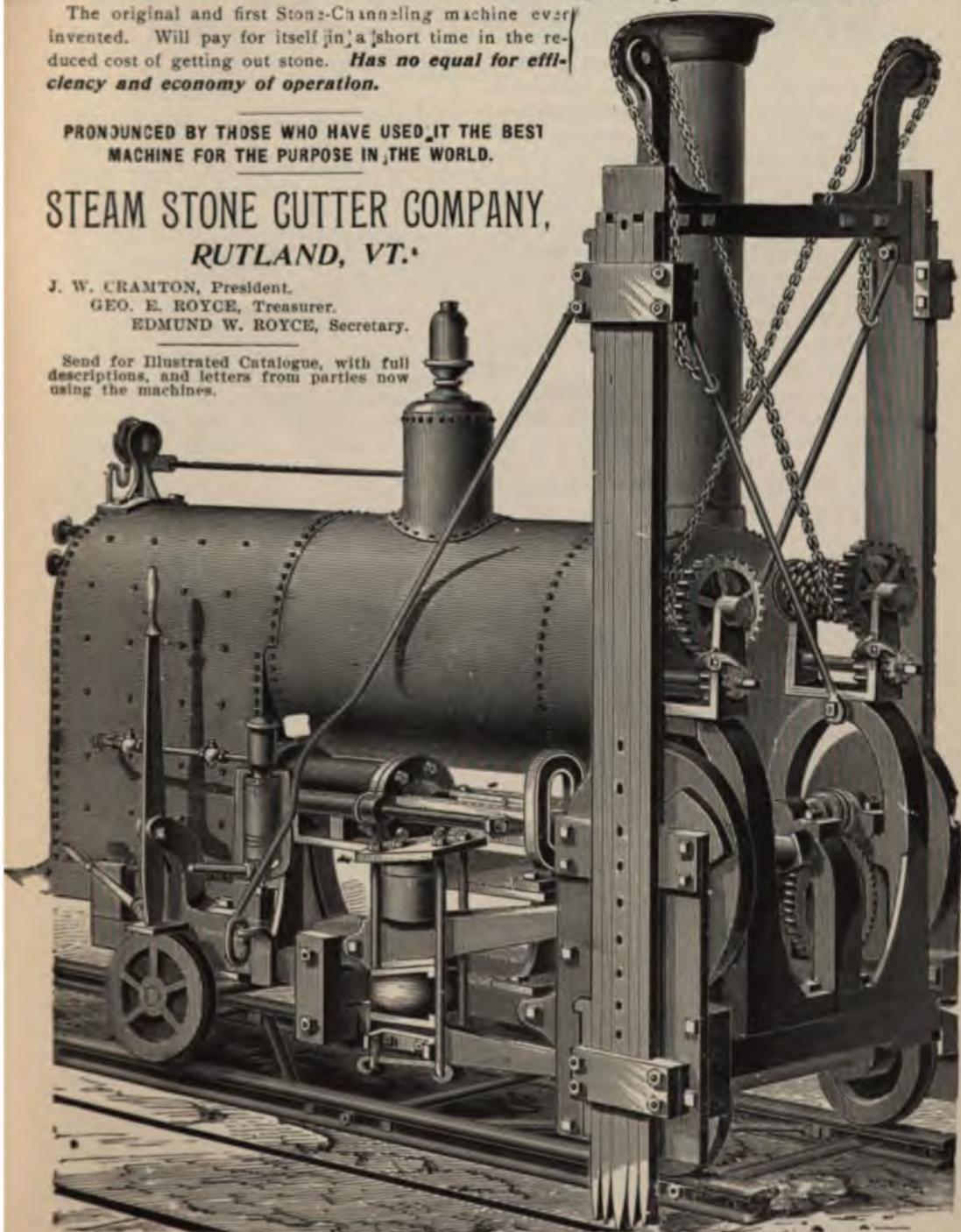
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Cleveland, O., August 2, 1899.

I can only report that trade is fair with us at present. Although there is considerable building going on, we have to be satisfied with trimmings, etc., and that leaves us at all times with men idle. The records of the building inspector's office show that there were 269 permits issued during July, the value of the buildings being \$695,965. The largest of these buildings is the East High School, which was reported in July STONE. Architects are busy and plans for several large blocks have been completed. Permits for them will be taken out in a few days. Nothing is heard nowadays of the municipal and county buildings, postoffice or library. If politics has had as much to do with the delay of public improvements in other cities as it has in Cleveland, craftsmen all over the country are entitled to sympathy.

D. GWILYM GEORGE.

Fort Worth, Tex., August 4, 1899.

The stone trade is very quiet in this section of the State. The Texas & Pacific depot here is about finished and ten days more will complete the stone work, which was done by John Sinclair, of St. Louis. It is an excellent job. The stone used was Pecos red sandstone. The Santa Fe depot is about half done. It will take six weeks to finish it up. Smith & Barden, of this city, are the contractors. They are general contractors and do their own stone work. There is quite a lot of good stone trimming on the building. This season there have been put up several nice residences. One for a banker from Galveston, is a very fine job of stone work done by David Hughes, who owns the only stone mill in the city. The courthouse in McCulloch county was let in July to Martin & Moodie, of Comanche, Texas, at \$37,000, all stone to be quarried near the town where the house is to be built. James R. Gordon, of San Antonio, had his plans adopted for an \$85,000 courthouse in Harrison county, Tex., contracts in which will be let August 16. These are

the only courthouses going up this fall of which I have heard. There will be a \$50,000 library built, from a donation by Andrew Carnegie. Press reports say that it will be begun inside of ninety days. Work on the Southwestern College at Georgetown is begun again, and it is said that funds enough are on hand to complete the building. It is an all-stone job. The stone trade has been in a very satisfactory condition at Austin all season, and favorable reports of building activity come from all parts of Texas. GOWAN.

Sault Ste. Marie, Mich., August 10, 1899.

There has been very little doing here in the stone line so far this summer, but I think we shall have plenty of work before long. An immense structure is under way; a power house, which, it is said, will be when it is completed, the largest building of its kind in the world. It will be 75 feet wide, 75 feet high and 1,400 feet long. It will be of concrete, steel and red sandstone and will be absolutely fireproof. Work has been begun on it, and it will be completed some time next summer at a cost of over \$1,000,000. The Edison-Sault Electric Company has installed a 100-horse-power motor at the lower end of the big water power canal. This motor will be used to run a giant stone crusher, which will crush the stone to be utilized in the construction of the power house.

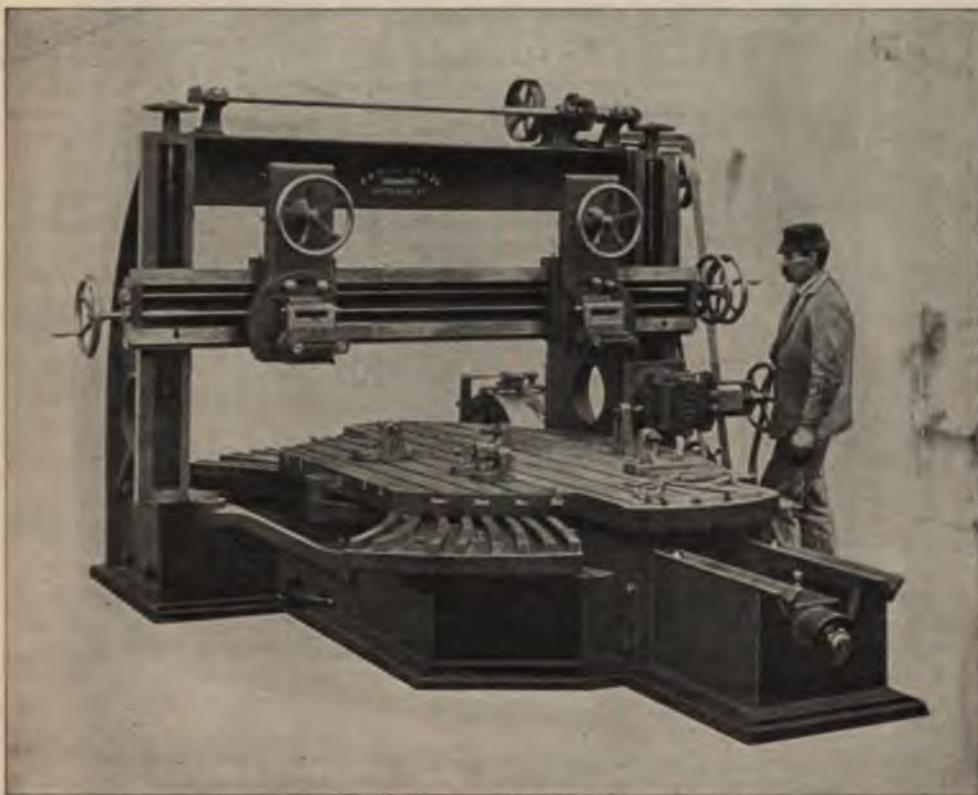
HUGH MILLER.

Washington, D. C., August 5, 1899.

During the month of July 258 permits were issued for new buildings, additions and repairs, the amount of the sum involved being \$669,399. Architect Henry Ives Cobb has prepared the plans for a handsome new residence for Mr. Arthur Cowsil, on Columbia road. It will be built of brick and red Seneca stone. The general style is Romanesque. There will be an elaborate doorway with decorative columns richly carved. Mr. Appleton P. Clark, Jr., has designed a residence for Mrs. Arthur M. Summerville, also to be erected on Columbia road. This will have an entrance through a loggia of richly carved stone. The exterior will be pressed brick and brown stone with terra cotta trimmings. A brick and stone house is to be erected by

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H. E. Mylon, of Massachusetts avenue. The contract for stone for three houses for James Dowrick on S. street has been awarded to William H. Chapple. J. A.

A Monument of Onyx.

An immense natural monument of the magnificent marble known as onyx is to be seen in the inner depths of a cave situated on a lonely mountain property recently purchased by a wealthy Westerner named R. D. Kellogg, of Des Moines, says the Des Moines Register. The cave that contains this agate giant is located in the mountains at Camden county, and is known as Ha Ha Tonka, deriving its name from a river which has its source there and which was so named by the Indians from its liquid loveliness, which they likened to laughing water.

To get to the wonderful onyx monument, which is as perfect as though chiseled by a sculptor and well worth a trip across the continent to see, it is necessary to penetrate into a deep cave. The easiest way to travel is to row on the surface of a subterranean river, which flows from somewhere in the interior of the mountains, and which leads into the heart of the cave, and whose walls and roofs, seen in the light of the torches of visitors, are a glittering mass of mineral marvels. The discoverers of this cave had rowed but a short distance on the subterranean river when they were astonished and wonderstricken to see the great onyx monument rising before them. It was perfect in formation, immense in size, and worth at the lowest valuation \$100,000.

So perfect was the formation of this monument that it was at first hoped it would be possible to transport it by some means to one of the museums of the country, but it was found that its size precluded the possibility of such an undertaking. For the present, therefore, it will be allowed to remain in the cave for the benefit of sightseers who wish to gaze on such a wonderful monument before it is destroyed. So proud is the owner of the property of his cave and monument that he proposes to build a railroad forty-three miles long in order to bring the only spot on which the subterranean river is to be found in touch with the outer world.

Ha Ha Tonka is located in Camden

county, Missouri, and the Osage tribe of Indians formerly inhabiting that portion of the country gave it its name. The topography and physical features of the country in the vicinity of the spring are characterized by scenery as grand and imposing as can be found anywhere. There are found no lofty mountains, no altitudinous peaks whose snow-capped summits repose in a climate of eternal frosts, but instead there are beautiful forests, open woodlands, impulsive mountain streams, terraced hills, cavernous canyon, caves, grottos and parks, a natural bridge, island, lake, and subterranean river, high frowning silurian walls, rugged, corrugated and sinuous, upon whose grizzled countenances are chiseled an age so remote that one gazes in wonder and awe upon them; beautiful valleys and cozy caves, where forest birds sing and wild flowers bloom in endless profusion. It is a wonderful spot and a worthy hiding place for the great monument.

In the great cave explorations have been made for nearly one and a half miles. As your boat glides along new wonders are continually unfolded. Stalagmites hang from the ceiling, which glitter like a starlit sky. Far in the interior of this cave the stream drifts your boat to a shingly bank, and, standing upon this bank, you can see the wonderful stalagmite monument of pure white onyx standing thirty-five feet high and fifteen feet in diameter.

Sewage Disposal in Paris.

On July 1 the river Seine ceased to be a recipient of the sewage of the vast metropolis. It will all pour into one huge central drain, and be carried off to two immense suburban sewerage farms situated respectively at Trial and at Mery. The latter is a high line sandy plain, known in the district as the Sahara of Paris. With the help of the sewage it is to be converted into pasture lands, and it is hoped that when thus changed this now sandy waste will aid the solution of the problem of supplying the metropolis with pure milk. Sewage farms have already been tried on a small scale at Gennevilliers with such phenomenal success as far as the fertilizing of the land is concerned that it was resolved to deal with the entire metropolitan sewage in this fashion.



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Book Reviews.

"THE TREASURE STATE." MONTANA AND ITS MAGNIFICENT RESOURCES., Helena, Mont.: Independent Publishing Co., State Printers.

This is an extra edition of the "Sixth Annual Report of the Bureau of Agriculture, Labor and Industry of the State of Montana, for 1898." In the latter year Commissioner J. H. Calderhead issued his annual report, which was so admirable and so filled with useful information that the edition was soon exhausted. The present pamphlet is a somewhat condensed edition of this report issued to meet an overwhelming demand. Owing to the expense entailed it was impossible to include all of the suggestive tables and the colored maps. But Commissioner Calderhead has done his best to supply the deficiency by providing an article which embodies the principal features and facts of the tables excluded. The State Bureau is to be congratulated upon the report, which is in every way creditable to the State and will do much toward the development of its resources. There is comparatively little literature concerning the industries and resources of the Western States, and money could not be spent to better advantage by every one of these commonwealths than by following the lead of Montana in this respect.

COLORADO, BULLETIN NO. 3: MINING LAW RELATIVE TO BUREAU OF MINES AND PRECIOUS METAL PRODUCTION. Harry A. Lee, Commissioner of Mines. Denver: State Printers.

This bulletin contains the amended law relative to the Bureau of Mines, that went into effect July 9, 1899. The changes from the former law are relative to the duties and powers of the State Inspector as well as amendments to the rules and regulations for the government of metalliferous mines. The tables of the production of precious metals in the State during the year 1898 are interesting. The total production was as follows: Gold, \$23,534,531.28; silver, \$13,690,265.15; lead, \$4,117,043.24; copper, \$1,304,504.28; total, \$42,646,343.95. The total for 1897 was \$35,964,033.92, showing an increase for 1898 of \$6,682,310.03. By far the largest percentage of this was in the production of gold, which showed a gain of more than \$4,000,000.

ANNUAL REPORT OF THE INSPECTOR OF MINES OF THE STATE OF KENTUCKY, FOR THE YEAR 1898. G. W. Stone, Inspector, C. W. Logan, Assistant. Louisville, Ky. Geo. G. Fetter Printing Co.

The office of the Inspector of Mines of Kentucky was created in 1884, with an office at Frankfort. In 1898 an act was passed authorizing the removal of the office of the Inspector, together with the property and effects of the Geological Survey, to the State College at Lexington. This change has been of benefit to the Department of Mines, as it affords more room for the work and gives an opportunity for proper display of the collections made by the survey. Inspector Stone's report is a very full and complete one, showing a total coal production of all of the mines of the State, including cannel, during 1898, of 3,542,132 short tons, a net gain over the production of 1897 of 238,078 tons. The greater part of this gain was in the southeastern part of the State, and was occasioned by the absence of prolonged strikes and the almost continuous operation of the mines. From present indications the production for 1899 will show an improvement over 1898. The cannel production of the State is less than during any year since 1893, there being a loss of 6,621 tons. One explanation of this is that most of the production is exported and marketed in foreign countries and much of it in Spain. The production of coke was only 21,393 tons, as against 32,284 for 1897, a loss of 10,891 tons. The gross number of employees engaged in all departments of mine labor was 8,408 and there were only six fatal injuries to operatives.

EIGHTH ANNUAL REPORT OF THE BUREAU OF LABOR, STATISTICS AND MINES OF THE STATE OF TENNESSEE FOR 1898. A. D. Hargis, Inspector. Nashville: J. J. Ambrose, Printer.

We have received from R. A. Shiflett, the Commissioner of Labor and Inspector of Mines of Tennessee, a report of his predecessor, Mr. A. D. Hargis, for the year 1898. The total number of coal mines reported was 76, of which 61 were actively at work and produced a total tonnage of 3,084,748, valued at \$340,346. The maximum number of employees was 7,820, and the number of fatal accidents, 20. The ton-

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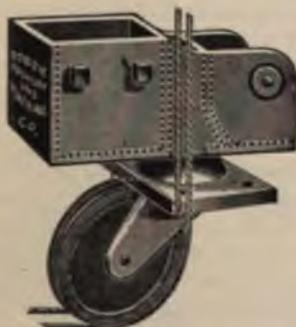
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*Steam Hoisting Engines.
Horse Power Hoisters.
Hand Power Hoisters.
Derricks.
Derrick Irons.
Sheaves and Tackle Blocks.
Rooter Plows.
Centrifugal Pumps.*

Dobbie Foundry and Machine Co.,

NIAGARA FALLS, N. Y.

NEW YORK OFFICE:—38 Day St.

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nage of coke was 384,545, with 375 employees, and here was a production of 595,777 tons of all varieties of iron ore; 89,721 tons of copper ore; 454 tons of zinc ore, 1,250 tons of manganese ore, and 272,191 tons of phosphate.

ANNUAL REPORT OF THE MINE INSPECTOR FOR THE INDIAN TERRITORY TO THE SECRETARY OF THE INTERIOR FOR THE FISCAL YEAR 1898, Luke W. Bryan, Inspector. Washington: Government Printer.

During 1898 there were twenty coal operators in the Indian Territory, who employed a total of 3,529 men, and got out 1,458,098 tons of coal, the largest quantity ever reported in one year. The coal is generally of a good quality. The mines are well equipped and the use of improved machinery is noted. During the past few years the production has increased over 50 per cent., while the number of mines has remained about the same. The rules for safety have been very well enforced and the number of fatal accidents during the year was only seventeen, as against twenty-two in 1897. There are only two coke plants in the Territory, which made during the year 34,810 tons of coke.

BUCHANAN'S PATENT CRUSHING ROLLS. Philadelphia and New York: The George V. Cresson Co. Illustrated.

This is a very interesting catalogue that deserves far more attention than most trade publications of its kind. In the prefatory matter is given a brief history of the introduction and development of Cornish rolls and of the work done by machines of this kind. The first rolls of which any record is found were made nearly a century ago and were erected by a Mr. Taylor at the Wheal Crowndale Mines in Cornwall, whence they derive their name. The results obtained from the early machines, infinitely inferior in design, material, and workmanship to the best modern rolls, prove that crushers of this form have a great capacity and are exceedingly economical in the use of power. The description and illustrations of the Buchanan rolls, which the company manufactures, are worthy of the attention of engineers and will be found full of help and suggestion.

Tempering Drills for Hard Rock.

A correspondent of the "Blacksmith and Wheelwright," with an experience of several years in a western region of hard granite rock and ten years in the southwestern lead and zinc mines, tells his way of dressing drills:

"I use the best black coal I can get and heat my steel to good soft heat; then I hammer the sides down, first staying it back on the edge, say three good blows on each edge; draw down the corners and work the same back until you think it will make a square bit. Then turn it on the side and hammer it down until it is a little smaller than the bit wanted; turn it over on the anvil and bevel. Strike it from ten to fifteen hard blows on the edge, turning it over every blow. This is what I call packing the steel, and in treating this way care should be used not to hit it on the side. One blow on the side will undo all the good accomplished by the hard blow. It is packing the steel that gives it the staying qualities. If the bit is too wide, file it down.

In tempering, I have used many processes, but have never found anything better than clear soft water with a little lime in it; salt may be added to make a brine, but have never found that of much advantage. If there is no time to let the steel get cold, let it get out of the red, then put it in water until it is cold; after which it should be heated as short as possible, say one-quarter of an inch, with a perfectly even heat, and slowly until fine scales can be seen on it. It is then hot enough and should be put in the tempering bath to a depth of say, one and one-half inches, keeping it in motion and gradually drawing it out of the bath. At this point the trained ear will recognize when there is enough heat left to make it run down to a light straw. Then put it back in the water, allowing it to remain on the bottom of the vessel for five minutes. If this method is properly and carefully followed, the drill will cut the hardest kind of granite.

I should advise all smiths who have drills to handle to watch the different degrees of carbon. High carbon wants lower heat than low carbon. A good plan is to watch the head of the drill while it is heating. In a high carbon drill it will

"Eureka" Rock Drills..



**For Use With Steam
Or Compressed Air.**

Drills Repaired and Fitted with Our
"EUREKA" VALVE.

THE JOHN M. ROGERS
Boat, Gauge & Drill Works,
GLOUCESTER CITY, N.J., U.S.A.

THE PULSOMETER STEAM PUMP

"The Contractor's Friend."

OFTEN IMITATED—NEVER EQUALED.
OVER 20,000 IN USE.



Recent Important Improvements.

The Handiest, Simplest, and Most Efficient Steam Pump
for General Mining, Quarrying, Railroad, Irrigating, Drainage,
Coal-washing, Tank-filling, Paper Mill, Sewer and Bridge
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Muddy or gritty liquids handled without injury to the Pump.

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break off, in a low carbon it will turn over. If after this treatment the bits should be made stiffer and breaks again it is unquestionable evidence that it has not been forged right or heated as it should be for tempering. There will be but little difficulty, and all drills will do their share of work if properly forged and tempered. The hammer used should be from three to three and one-half pounds.

Liquid Air in Mining.

In a lecture on liquid air, recently given by Mr. Dommer to the French Association for the Advancement of Science, he observed that this substance can now be obtained under sufficiently economical conditions to permit its use, not only for the production of low temperatures, but also for making explosives. Mixing coal, liquid air, and cotton together affords a kind of sponge which can take the place of dynamite; but as the explosive loses its properties after fifteen minutes, it must be prepared at the place where it is to be used. On the other hand, however, there is no danger of theft, or of a cartridge that has missed fire exploding unexpectedly. The preparation of this explosive is, moreover, economical, since the production of a kilogramme (2 1-5lb.) only requires the expenditure of three to four horse power hours; and at the present time an air compressor is being erected at the works of the Simplon Tunnel for producing 7 to 8 liters (about 13 pints) of liquid air per hour.

Test of a Fireproof Building Material

A test was recently given in London to the fire-resisting building material called "scagliol," which has been in use in Germany for some years. Its precise composition is not stated, but it is described as a mixture of plaster of Paris, slaked lime, and other ingredients subjected to a complex chemical treatment; sand, coal-ash, or other similar material being afterwards added. It is claimed to be fire-resisting and sound-proof, neither weighty nor bulky, and to be considerably less in cost than ordinary plastered brick work. For walls which are not required to carry much weight it lends itself to a simple and ingenious method of construction. The slabs in which it is made are grooved

round the edges, in which holes a few inches deep are provided at short intervals. A wall may therefore be built by setting these slabs up lengthways in single horizontal rows and pouring a special form of scagliol mortar down the tube formed between each pair of slabs by the side grooves. The mortar fills up the grooves and the holes, cementing the whole into a solid structure. To show the fire-resisting power of the material, a fire of 3 cwt.s. of wood, soaked in paraffin, was arranged in a small room built of scagliol, the outside walls being 4 inches thick, and an inner partition 3 inches. The temperature in the room rose to about 2,000 degrees, as measured by a pyrometer, yet a thermometer hanging on the other side of the 3-inch partition did not rise above 78 degrees while the fire was burning. To further prove its non-conducting properties, pieces of sulphur and pitch were enclosed in a block of scagliol and placed in the middle of the fire, where they remained for about half an hour. When removed, the sulphur was unaffected and the pitch just showed signs of melting. The structure as a whole was only superficially affected by the fire. Other tests were made to show the strength, etc., of the material, and specimens of "petrura," a kindred composition, were also on view.

Bargains in Tombstones.

A special dispatch from Flushing, L. I., to the Brooklyn "Eagle" says: "There is an interesting contest on between two firms engaged in the tombstone business at Flushing. The rivals have their shops near the Flushing Cemetery. One firm is composed of young and energetic men, who seem lately to have out-distanced their older and more conservative competitor. They have been getting the shekels that formerly fell into the pockets of the elder man. The latter tried everything to outdo his competitors. He placed an attractive array of monuments, foot stones and other graveyard ornaments outside, but this scheme didn't work. He finally thought of the bargain counter idea and he put the prices on the stones. Now, when the visitors to the Flushing Cemetery pass the tombstone shops they see plastered all over the stones big flaring price marks. Some are marked: 'This stone for \$25, reduced from \$35; a bargain at \$50.'"

A. LESCHEN AND SONS ROPE CO.,

SOLE MANUFACTURERS OF

FINLAYSON'S PATENT

PATENT FLATTENED
STRAND WIRE ROPE.

Also "HERCULES" WIRE ROPE
and all kinds of
ROUND STRAND WIRE ROPE.

Wire Rope Tramway

The only
satisfactory
one on the
market.

Estimates on
application.

920-922 North Main Street, ST. LOUIS, MO.



DIXON'S PURE FLAKED GRAPHITE

*Is a Blessing to Every
ENGINE ROOM and MACHINE SHOP.*

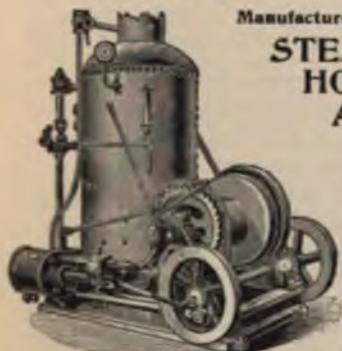
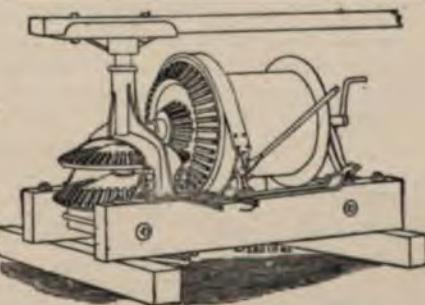
A small quantity added to any Oil or Grease largely increases its lubricating value and makes the finest Cooling Mixture. Pamphlet and Sample Sent Free.

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Hoisting Machines

Steel or Wood Derricks Complete.
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129 Erie Street, - BUFFALO, N. Y.

McKIERNAN DRILL CO.

120 Liberty Street, New York.

Works, Paterson, N. J.

Latest
Improvements in

Rock Drills

More efficient, more economical, and constructed of fewer parts
than any other.



Air Compressors of the most modern
design.
Quarrying Machinery.

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Utilizing Small Heads of Water.

According to a French contemporary, while American engineers do not utilize falls of less than two and a half feet for driving turbines, their French colleagues turn to account falls so slight as four inches, because at Maquens, near Carrassone, a "turbinette" working with this column of water develops a power of nine kilograms, raising the water to the height of thirty-five meters; and at Aixen-Savoie water is raised to the height of fifty-five meters (180 feet) with an available fall of twenty-five centimeters (ten inches). At Toulouse a turbine working with a column of fifty centimeters yields a force of fifteen horse power. In order to obtain good results all that is required is to arrange that the turbine be constantly under water.

To Control the New Mexico Mica Fields.

The St. Anthony Crystal Mica Co., of Colorado Springs, Colo., recently incorporated, are reported to have obtained control of all the New Mexican mica fields. Some of the mines are located within 20 miles of the Denver & Rio Grande Railroad, at a point 100 miles south of Santa Fe. The product of the mines will be shipped to Colorado Springs, where machinery for working it into merchantable shape is now being set up.

A Memorial for Novelist Black.

At a meeting of the committee of the William Black Memorial held in London recently, the various schemes proposed were submitted. It was ultimately resolved to devote the sum subscribed to the erection of a beacon light at Duart Point, near the Lady Rock, on the coast of Mull. This scheme has the approval of Mr. Black's family. Plans are to be forwarded for the erection of the beacon by the Northern Lights Commissioners, who have promised to maintain the light after the erection is complete. The cost will be about £800.

A Giant Statue of De Lesseps.

One of the next international episodes with which the world is to be treated will be the ceremonies connected with the unveiling of the giant statue of Ferdinand De Lesseps at the northern entrance of the

Suez canal on November 17, the thirtieth anniversary of the opening of that celebrated artificial waterway. The occasion will be one of great pomp and splendor, mingled with a sentiment of complacent victory by reason of the brilliant success which has crowned the undertaking of the great French engineer.

Blacksnake Exploded.

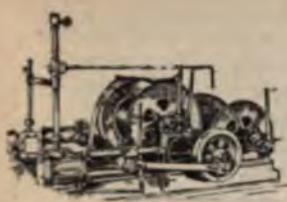
The Pen Argyle (Pa.) "Index" has the following: While blasting rock near Minnequa Springs on Saturday John Ludwig came upon a black snake. The reptile was sluggish and evidently had just feasted, but when the quarryman secured a club it coiled itself and showed fight. After some trouble Ludwig approached near to deal the snake a fierce blow on the head. A terrific report occurred and the quarryman was hurled violently to the ground. The shock stunned him. When Ludwig got up he discovered that the snake had been blown to pieces, all that was left being a piece of tail. For a time Ludwig failed to realize what had happened. Then he saw that a stick of dynamite was missing. It is believed that the reptile swallowed the explosive and that the blow on the snake's body was the cause of the explosion.

Cleaning Marble Slabs.

The application of a mixture of unslaked lime and liquor potassae about the consistency of cream is recommended. The addition of some polishing agent (as pumice stone) is an improvement. The mixture is applied with tow to the surface in the evening, and to remain all night. In the morning it is removed, and the marble washed with water and polished. Oil spots can be removed by the application of a paste of Fuller's earth, after moistening them well with benzine.

Lord Elgin's Granddaughter a Sculptor.

Miss Grant, the sculptor, whose bust of Gladstone is attracting so much attention in England, is a niece of Sir Francis Grant, former president of the Royal Academy. Her mother was a daughter of the Lord Elgin who saved the Parthenon marbles from vandalism at the hands of the Turks and brought them to England, where they are known by his title.



THOMAS CARLIN'S SONS,

MANUFACTURERS OF
HOISTING ENGINES, DERRICKS, CONCRETE MIXERS,
CONTRACTORS DUMP CARS AND MACHINERY.
LARGE STOCK OF NEW AND SECOND HAND MACHINERY.

190 LACOCK ST., ALLEGHENY, PA.

ALLEN WALTON, President.
ALLEN K. WALTON, Sec'y and Treas.
ROBERT J. WALTON, Sup't.

Established 1867.

CONTRACTORS FOR
ALL KINDS OF CUT STONE
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HUMMELSTOWN BROWNSTONE CO.,

Quarrymen and Manufacturers of

BUILDING STONE, SAWED FLAGGING AND TILE.

*Parties visiting the quarries will
see cars at Brownstone Station on
the Philadelphia & Reading R. R.*

Waltonville, Dauphin Co., Pa.

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VULCAN STEAM SHOVELS

Received Highest Award at World's Fair.

VULCAN IRON WORKS CO., TOLEDO, O.

Manufacturers of "Reilly" Brake Shoe.

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RAPID STONE SAW CO'S BLADE.

Saves the Mill Owner 33%.

Increases Production 200%.

Prices, Printed Matter and Information of

RAPID STONE SAW CO.,

630 Bourse, Philadelphia, U. S. A.



Cable Hoist-Conveyor at St. Paul, Minn.

CABLE Hoist-Conveyors,

LAURENT-CHERRY PATENT SYSTEM.

requiring no Fall-Rope Carriers; and others.

MANUFACTURED BY

The Trenton Iron Co.,

Trenton, N. J.

Engineers and Contractors and Sole Licensees in
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Rope Tramways. Also, Wire Rope Equip-
ments for Surface and Underground
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NEW YORK OFFICE—Cooper, Hewitt & Co.,
17 Burling Slip.

CHICAGO OFFICE—1114 Monadnock Building.

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To Harden Plaster of Paris.

A solution is prepared by dissolving boracic acid in warm water and adding sufficient ammonia to form ammonium borate, which remains in solution. This liquid may be either mixed with the plaster in molding or applied on surface with a brush. In the latter case the saturation is carried out in the cold. The objects are subsequently rinsed off and dried. The substance becomes very hard after two days and insoluble in water, while the induration in the interior advances more slowly. By means of the fluid described gypsum floors can be hardened and rendered more durable and impervious to the influence of the weather. Saturating with ammonium borate is said to be especially useful on exterior wall of buildings, barracks, etc. Experiments have proved an antiseptic action of the liquid.

A Concrete of Remarkable Strength.

A concrete of remarkable strength was described by James Christie, M. Am. Soc. C. E., at a recent meeting of the Engineers' Club, of Philadelphia. Cement mortar, one; slag or broken stone, four; cast iron cuttings (by weight), two. Add one pound of sal-ammoniac for each fifty pounds of iron. This concrete weighs 210 to 220 pounds per cubic foot, and will stand a crushing load of 3,000 pounds per square inch after four months. If the sal-ammoniac is omitted its strength is about half as great.

Tidal Power.

It is stated that a London capitalist has offered to construct at Southend a huge sea wall at a cost of £600,000. In return he asks permission to use the tidal force for working a generating plant, with the idea of supplying London with electricity. He guarantees there shall never be less than three feet six inches of water on the beach; in fact, it will be a huge marine lake. No particulars are given as to the kind of water engine to be used.

A New Use for an Old Aqueduct.

An old subterranean aqueduct, five miles long, which cost about £80,000 some hundred years ago, between Nenthead and Alston, England, is, it is rumored, to be brought into use by the Vieille Montagne

Lead and Zinc Mining Company, Nenthead, for the conveyance of mineral from their mines at Nenthead to Alston railway station. The aqueduct, which is cut through rock, was designed to drain the mines in the district, and to test the bearing power of the sills.

Put Up His Monument Before Death.

Lord Eshers' monument, with recumbent effigies of himself and his wife, was set in place over the family tomb eleven years before he died. He had it carved to suit himself and then decided to place it where it was to stand rather than store it till it was needed.

A Novel Monument for Gettysburg.

A novel sort of a monument is to be erected on the Gettysburg battlefield in September by the survivors of the Thirteenth Vermont regiment. The statue will show the bronze figure of an officer, his right hand upraised holding a hatchet. The story as to the design of the statue is told as follows: First Lieutenant Stephen F. Brown, of Company K, Thirteenth Vermont Volunteers, was the model for the statue. Just before the battle he was placed under arrest and was relieved of his sword for having forced a guard from a well in order to get a drink of water while on the march to Gettysburg. During Pickett's charge Lieutenant Brown, not having a sword, seized a hatchet and fought with it through the charge. After this heroic conduct Lieutenant Brown's sword was returned to him without a trial. He was afterward promoted to be captain.

Rosin as Protection Against Moisture in Walls.

Heat five parts of turpentine and stir in ten parts of pulverized common glue and one part of finely sifted sawdust. Cleanse the wall and heat it by means of a soldering lamp or other flame and apply the rosin composition, which can be run into every crack and joint by keeping the wall warm. Smooth by use of a hot iron. An addition of bone black to the composition will give a dark color, or if the wall is to be painted, a light color can be had by using light colored rosin and woody fiber. This composition is also good for wood buried in the ground or exposed to moisture.

SITUATIONS WANTED.

Advertisements under this heading inserted for subscribers to STONE free of charge. Advertiser must send 25 cents to pay postage, if replies are to be addressed in care of STONE. Rate to non-subscribers, 10 cents a line each insertion.

A Man of long experience in the granite trade is open to engagement as superintendent or manager of manufacturing concern. Specially posted in the monumental trade; familiar with plans, details, estimates, management, etc. L. M., care STONE.

TO SELL. TO BUY. TO EXCHANGE.

Advertisements inserted in this department for 15 cents a line each insertion.

ACITIVE interest in established and paying business wanted by bookkeeper with 20 years' experience in architectural iron, stone and woodworks in New York City and vicinity, "in exchange" for \$8,000 equity in real estate. Address "ACCOUNTANT," care of STONE.

FOR SALE OR LEASE—Quarry of the Rock River Brownstone Co., near Marquette, Mich. Will sell or lease this property on a royalty. Machinery for operating on the premises. Correspondence solicited. Address W. I. BROTHERTON, Bay City, Mich.

FOR SALE.—A marble countersinking and moulding machine, good as new machine. Address D. L. CROSSCUP, N. E. corner 23d and Chestnut streets, Philadelphia, Pa.

WANTED.—A quarry foreman who has had experience quarrying to dimensions with channeler and steam drill. Permanent position in an established Oolitic quarry. Inquire or write to J. M. CONDIT, 1230 Monadnock Block, Chicago, Ill.

FOR SALE—Blue Stone Quarry, 37 acres, located at Summit, N. Y.; price \$2,000.00; terms easy. Particulars, address T. H. MAGILL, Troy, N. Y.

MACHINERY

For Sale—
Cheap for Cash.

Hoisting Engines, Air Compressors, Rock Drills, Rock Crushers, Dump Cars, Channeling Machines, Steam Pumps, Steam Shovels, Light Locomotives, etc., all in good condition.

WILLIS SHAW,
627 New York Life Building, CHICAGO.

PRESLAR'S NEW PROSPECTING CORE DRILLS.

A Cheap, Fast and Absolutely Accurate Method of boring Stone Quarry and Mineral Lands.

Solid Cores taken from 1 in. to 10 in. in diameter of all rocks passed through.

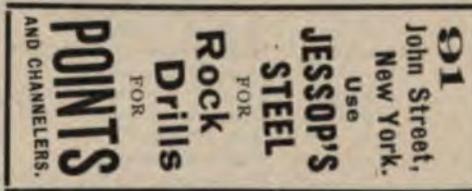
Soundings taken for Railroad Construction Work, Bridges, etc.

We make a specialty of prospecting by contract.

Particulars, Prices, etc., given upon application

BLOOMINGTON DRILLING CO.,

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**NORTH & SOUTH**

VIA THE
MONON ROUTE



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Redfern	2 00
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Bertholet	75
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Davidson	1 50
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Burnham	1 50
McMaster	6 00
Blagrove	75
Lee	1 50
Dobson	1 00
Booth	1 00
Vago	2 00
Biggin & Siebert	1 00
Collins	1 50
Gall	2 60
Spon &	5 00
Chamberlain's	per set
Jameson	25
Edwards	1 50
Beaton	2 50
Kirk	75
Gillmore	3 00
Blagrove	1 00
Hyde	75
Davies	1 25
Burn	2 00
Monckton	4 00
Merrill	5 00
Luard	1 00
Bale	3 60
Warren	2 50
Geikie	7 50
Cain	75
Hodgson	Theory of Solid and Braced Arches.
Stahl	1 00
Culley	75
Drinker	Tunnelling.
Nichols	25 00
Nichols	Tables of Cubic Measure.
Cain	50
	Tables of Superficial Measure.
	50
	Youssoir Arches Applied to Stone Bridges, etc.
	75

Remittances must accompany all orders. Prices quoted include cost of mailing. Order by title and author. Write your name plainly. Remit by postoffice or express money-order, draft or check, to the order of

FRANK W. HOYT, 45 Broadway, New York.

Try —

ASHBURTON MARBLE



*As a Decorative
Material.*

COLOR:

Dark grayish purple ground, interlaced with a net work of red and white veins.

*CAN BE OBTAINED IN BLOCKS OF LARGE SIZE.
TAKES A BEAUTIFUL POLISH.*

It is quarried in Devonshire and shipped F. O. B.
Bristol, by

ARTHUR LEE & BROS., LTD.,

Marble and Granite
Merchants

BRISTOL, - - ENGLAND.

A BUYER'S DIRECTORY
...OF...
The Stone Trades.

NOTE.—The display advertisements of the firms mentioned under each heading can be found readily by reference to the Alphabetical Index.

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Ingersoll-Sergeant Drill Co.
Rand Drill Co.
Sullivan Machinery Co.
Clayton Air Compressor Works.
Hall Steam Pump Co.

AIR LIFT PUMPS.

Clayton Air Compressor Works.

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Lord, Bowler & Co.
Sullivan Machinery Co.
Rand Drill Co.

BLASTING SUPPLIES.

Aetna Powder Co.
Ingersoll-Sergeant Drill Co.
Knox Rock Blasting Co.
Rand Drill Co.

BOILERS.

John Maslin & Son.

BOILER FRONTS AND FITTINGS.

The Vulcan Iron Works.

BROWNSTONE.

Hummelstown Brownstone Co.
New England Brownstone Co.

CABLEWAYS.

S. Flory Mfg. Co.
Lidgerwood Mfg. Co.
Trenton Iron Works.

COMPRESSED AIR SHOP TOOLS

Clayton Air Compressor Works.

CHANNELERS.

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Steam Stone Cutter Co.
Ingersoll-Sergeant Drill Co.
Lord, Bowler & Co.
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B. C. & R. A. Tilghman.

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CRABS.

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Rand Drill Co.
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The Vulcan Iron Works Co.

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Sullivan Machinery Co.
S. Flory Mfg. Co.
Lord, Bowler & Co.
New Albany Mfg. Co.
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Lord, Bowler & Co.
S. Flory Mfg. Co.
American Hoist & Derrick Co.
Ingersoll-Sergeant Drill Co.
Lidgerwood Manufacturing Co.
F. R. Patch Mfg. Co.
The Vulcan Iron Works.
Contractors' Plant Mfg. Co.
Dibble Foundry & Mach. Co.
Rand Drill Co.

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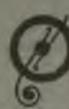


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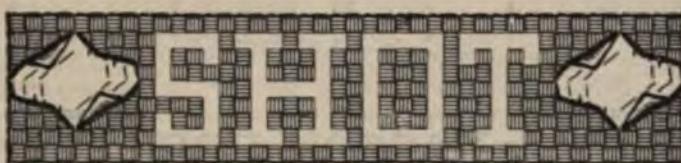
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QUARRY OF THE GENESSEE VALLEY BLUESTONE CO.





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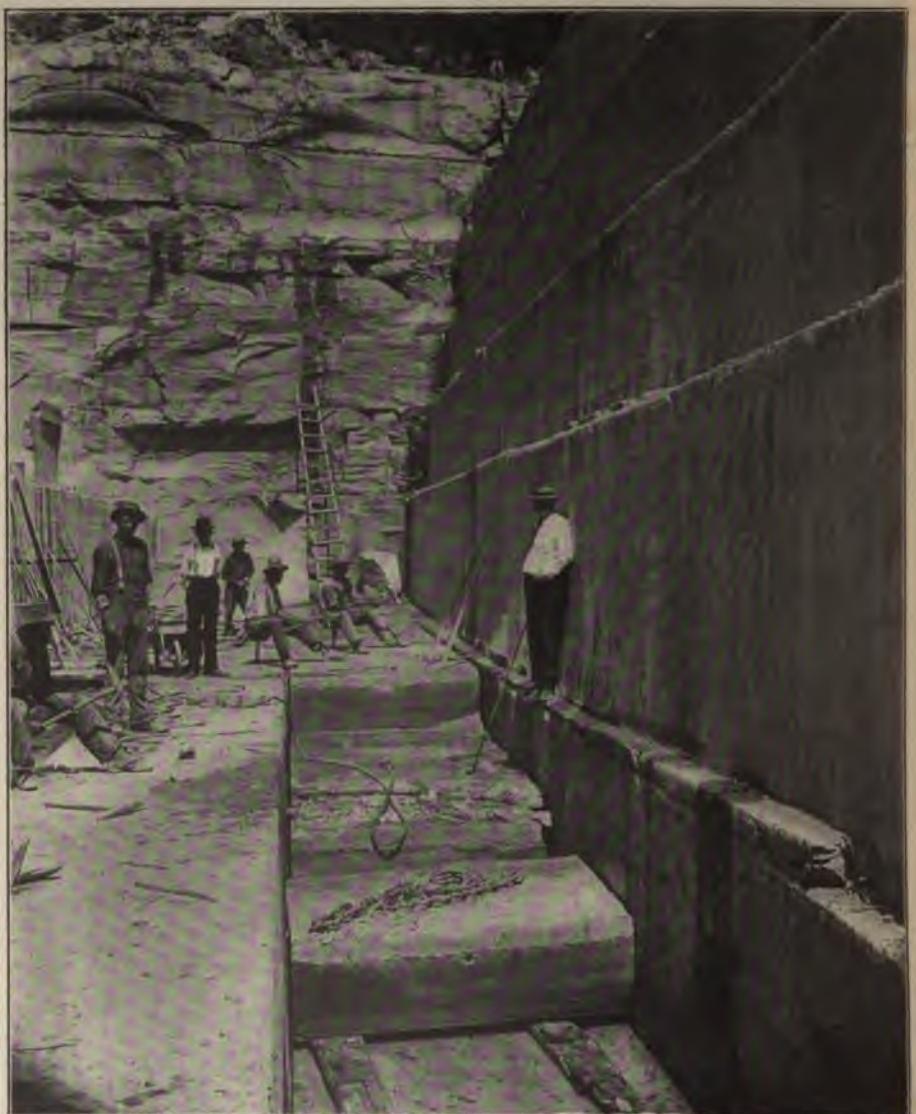
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PORTAGE BLUESTONE QUARRIES.

IN the July number of *STONE* was printed an extended article on "The Bluestone Industry of New York." This was devoted to one branch of the sandstone formation of New York State, that is geologically divided into the Hamilton and Portage groups, rocks of the Upper-Devonian age, which have various outcroppings of shales and standstones, extending in a wide belt with scattering appearances in the western part of the State. The bluestone of the Hamilton group is perhaps better known than the various deposits of the Portage group, because it is more widely used for flagging and other purposes that put it in evidence on every hand. The Portage stone, however, is one of the most valuable building materials that the State possesses, and it has so many decided merits that it is bound to grow in favor. The editor of *STONE* takes pleasure in presenting this month a number of typical views of one of the leading quarries of the Portage bluestone. These quarries are owned and operated by the Genesee Valley Bluestone Company. The offices of the company are at Portageville, N. Y., while the quarries are located at Bluestone, on the west side of the Genesee River, two miles south of Portageville and three miles from Portage Station, on the New York, Lake Erie & Western Railroad. The quarry property abuts on the main line of the Western New York and Pennsylvania Railroad. As will be seen from the illustrations given herewith, the quarries have been opened at the foot of a hill on a ravine. They have a face 160 feet in length, 100 feet in width and are 60 feet in depth.

The beds of stone run from two to seven feet in thickness, so that blocks of any size can be taken out. The supply of stone is practically inexhaustible, and owing to the admirable manner in which the quarry has been opened and in which the stone lies, almost every bit of rock in sight is available for building purposes. The quarry property embraces 200 acres in area, and all of it can be worked. A spur from the railroad runs to the works so that stone can be taken from the beds by a derrick and swung directly on to the cars.

The quarry was first opened about 1860 by the Portage Bluestone Company, but was worked in an old-fashioned, conservative way, and the stone was shipped by canal. Naturally enough these methods did not pay, despite

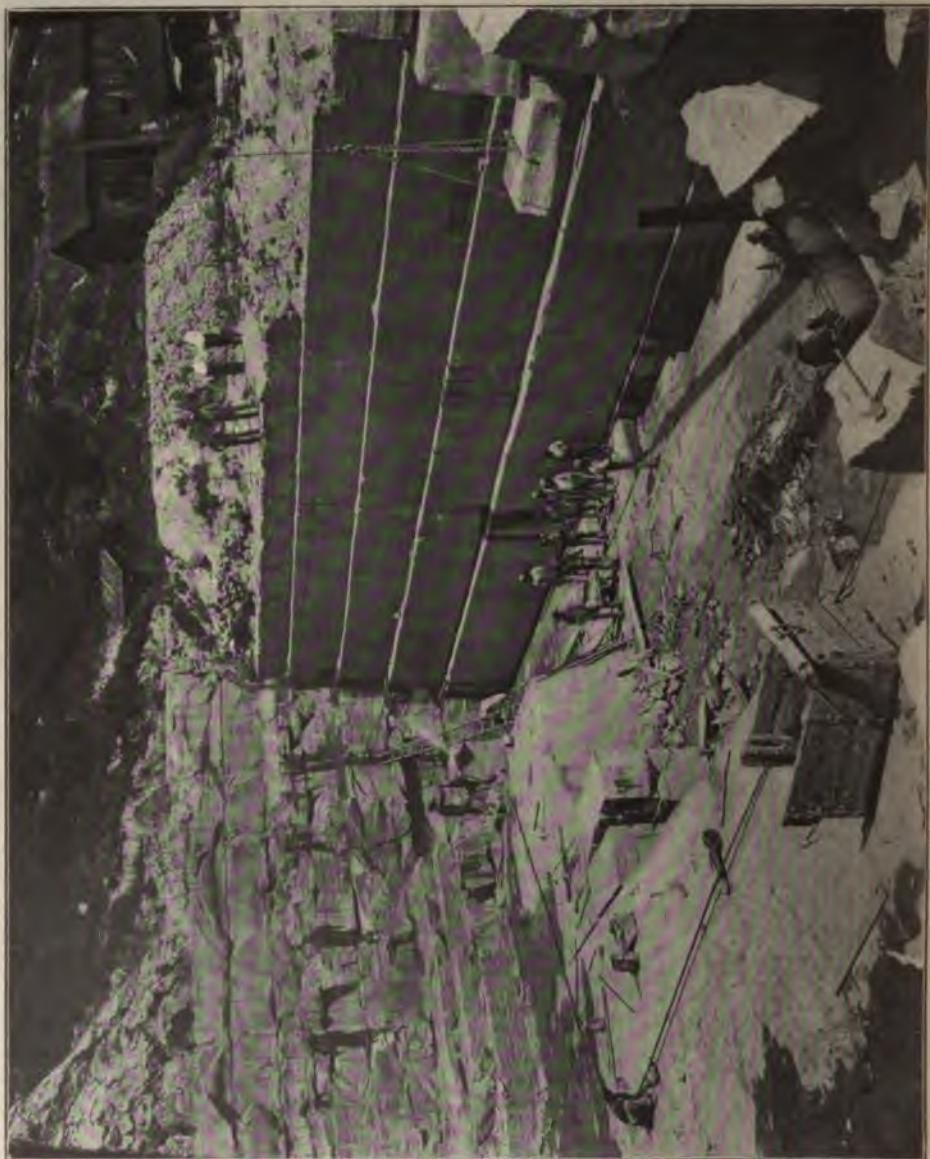


THE TRACK OF THE CHANNELER—PORTAGEVILLE BLUESTONE QUARRY.

the good quality of the stone, and the quarries were closed after having been worked about ten years. They were reopened in 1894 by the Genesee Valley Bluestone Company, of which Mr. W. J. Emerson, of Rochester, and Mr. Ernest F. Ayrault, of 100 Broadway, New York, are at present the largest stockholders. Mr. Emerson is the president and general manager of the company. One of the first things done by the new organization was to equip the quarry with new and improved machinery. A four-gang mill has been built and work is now being done on the foundation for six more gangs. The equipment includes a Wardwell channeler and improved drills and hoists. The entire equipment was furnished by Lord, Bowler & Co., of Cleveland, a sufficient guarantee of its excellence. About seventy men are employed, and the quarry is worked night and day. The business has grown in a very healthy and satisfactory manner, and during the past two or three years more than 300,000 feet of stone have been taken out. One reason for the success of the company is the care that has been taken in the selection of stone. None but perfect and flawless pieces have been shipped. The stone is used largely for trimmings, lintels, steps, etc., and owing to the ability to quarry large blocks, it is particularly fit for platforms.

The stone is largely shipped to New York, but many fine and notable buildings in Montreal, Baltimore and Philadelphia have used it in their construction. We present a view of the Canadian Life Assurance Building, at Montreal. The contract for the stone for this magnificent building, amounting to more than 45,000 feet, was, after a severe competition, awarded to the Genesee Valley Bluestone Company. The building was designed by Architect R. A. Waite, of Buffalo, N. Y., from whose plans was erected the Parliament Building at Toronto. The Montreal building is declared to be the finest commercial structure in the Dominion, and one that will bear comparison with any to be found elsewhere. It is elaborately carved in the manner of the French Renaissance. An excellent example of the use of Portage stone is to be found in the first and second stories of the Aldrich Court Building, No. 45 Broadway, New York, in which the editorial and business offices of STONE are located. From this it can be seen how easily the stone is worked and how admirably it weathers, every chisel mark being as sharp now as the day on which the stones were set. There are no evidences whatever of disintegration. The stone is bluish gray in color, fine grained, homogeneous in texture, and soft enough to dress well and be easily cut. It hardens somewhat on exposure to weather. Speaking geologically, the stone is soft argillaceous sandstone, free from organic matter, and made up chiefly of fine quartz sand, so perfectly cemented that it has scarcely any porosity. The geological report of the State says: "A representative specimen from this quarry was found to have a specific gravity of 2.695, an equivalent to a weight of 168 pounds per cubic foot. The absorption test indicated 2.97 per cent. of water absorbed; treated with dilute solution of sulphuric acid, the loss amounted to 0.42 per cent.; freezing and thawing tests produced slight scaling. In the test, at a temperature of 1,200 to 1,400 degrees F., the color changed to dull red. There were no checks, and the strength of the specimen was but little impaired."

FLOOR OF THE GENESEE VALLEY LIMESTONE QUARRY.



A GERMAN VIEW OF AMERICAN ARCHITECTURE.

HERR PAUL GRAF has recently published a book entitled "New Structures in North America," in which he has genial and generous praise for American architecture. Herr Gräf says:

"To begin with, the simple practicality of the buildings is to be observed. The qualities that so often come to the front in German buildings, straining for effect, intentional conspicuousness and strangeness, are entirely lacking. 'Most of us,' remarked Gabriel Seidl, recently, 'build not a house, but a poster for our building business.' For this reason the decoration goes beyond the limit of what is necessary and in good taste. The Americans know as little of this 'architecture game' as our older architects; they have the same sound, craftsmanlike feeling that lays all the stress on the thing done, none at all on exploiting the person who does it. In the next place, admiration is called forth by the originality of each house, its individuality, gained only through the fact that its form is determined in each case by its interior arrangement, and nothing is built for the sake of the façade. That is the reason, in the last analysis, why there is seen so little ornamentation intended merely to cover the intellectual poverty of a façade.

"In the third place, the observer is struck with the way in which delicate decorative elements of old periods are utilized. The builder is never under the sway exclusively of one old style. Antique art is not, to the child of this country, which has no old castles and no traditions, something that he must accept in its entirety, whose style he must copy with scientific accuracy; it is on the contrary, as it was to the artists of the early Renaissance, a treasury of 'motives,' with which he can work freely, according to his taste. It never occurs to him that he must build a Romanesque church or a Romanesque house; but he builds a modern church or a modern house, for which he chooses here and there a Romanesque decorative motive. Compare the little churches in Detroit with the Berlin churches, and see what this means. Our churches are almost without exception school examples of old styles; on their walls is piled everything that has been preserved as an ornament of the period, not on one building, but on many. Their effect is always cold and petty, while the American churches mentioned have a pleasant and dignified appearance, though almost without ornamentation. Or compare the Romanesque house of Chicago with the Romanesque Kaiser Wilhelm Memorial Church, which, with its endless round arch arcades, has the effect of a mausoleum. And in the American building, how gracefully the ornamental capitals come out as central points, while in the Berlin church the mass of uniform ornamentation leaves no impression!

"On examining in detail the chief points of superiority in the effect of American buildings, a special charm is found in the admirable use of the material. The rough, peasant-like finish of the hewn stone, though it often seems a little exaggerated for our taste, gives, nevertheless, the impression of being hand work, and quite excludes the idea of machine-like smoothness that

with us is a dominating one. By the contrast with smooth blocks or simple surfaces of terra-cotta or of wood, or both, fine artistic effects are produced.

"Now, what is the significance of these buildings for us, for our architects and builders? Are they models to be copied? Certainly not; for their own lesson is precisely against imitation. They tend rather to stimulate design according to the need predicated by each building, according to the material at hand and according to the national taste. They tend to show us how great the possibilities are in such a procedure; how much more genuine richness lies in following it than in exaggerated bedizement with superfluous ornamentation. Our best architects, indeed, are traveling in this same road. But the American buildings speak more plainly on account of their energetic and almost extreme carrying out of this tendency.

"And these teachings are not limited to exterior architecture. The same spirit has controlled the planning of the comfortable interiors, which are, to be sure, better known to us, and have had their influence."

JAPAN'S STONE TRADE.

GVERY tiny back garden in Tokyo contains among its floral and artificial ornaments slabs of natural rock, judiciously placed. Marvelous are the illusions produced by them with the aid of those dwarf trees that the Japanese gardener knows how to grow and train. It is absolutely magical to see what lovely landscape effects he can obtain out of an oxcart load of big stones and a few of these stunted plants. He will create for you with his dwarf pines and microscopical bamboos upon a few square yards of soil what looks like leagues of wild (or cultivated) country. There shall be a stream, and water meadows, and rice fields perfect, though each no bigger than a chessboard; a mountain tarn, with a carp in it and goldfishes and a tortoise shall appear; a flying bridge and a glittering waterfall and range of Liliputian but lovely mountains. Accordingly, rocks are an article in great demand, and Tokyo being an alluvial plain, without anything of the sort at hand, numerous dealers exist in the city whose business it is to bring in from the mountains and to supply their customers these indispensable adjuncts of Japanese horticulture. Great round stones from the bed of the river and square or oblong slabs of moderate size can be had cheap enough. But if you will go into something imposing for dimensions or remarkable in color or material, there are rocks on the Ishuja's yard that will cost you from one to two hundred yen—say \$50 to \$100. Learned treatises exist which teach how these rocks should be planted in the gardens, and what plants should be disposed near them; how you should build the ishibashi or bridge of stone; how you should stand the ishi-bumi or tablet bearing an inscription; where should be placed the ishi-doro or stone lamp-stand. Rocks that have a hole in them are much valued for ame-no-ishi or natural basins, and stones with a vein in them, ishime, may be of high value if the marks lend themselves to any fancy, religious or poetical, of the stonecutter.



CANADIAN LIFE ASSURANCE BUILDING AT MONTREAL, BUILT OF PORTAGE BLUESTONE.

BUILDING GOOD ROADS FROM WASTE ROCK.

NEW JERSEY has the best roads in the United States, and the steady progressive development of her hard road system will soon place her in the front rank the world over. To accomplish this result has required the best thought of engineers and practical road builders for the past twenty-five years. Two things have largely helped to bring this about. First and principally, she has had at her command (particularly in the middle and upper sections of the State) an unlimited quantity of the finest stone for the purpose in the world, the trap rock. Following close behind as to value for this purpose is the native granite of Northern New Jersey, just as suitable as the trap for all purposes except the finishing course of stone. In the latter respect the trap has no equal for wearing qualities. Secondly, and not least, the appropriation of State aid, amounting to \$150,000 per year, has helped to make at least \$1,500,000 worth of roads in all sections of the State. No appropriation of the State is granted more readily than this, and the benefits derived from its use and aid are incalculable.

When this aid was first extended to the people of the State, the farmers almost to a man opposed it. At the present time the applications for the use of this fund are so great that if all were granted no new applications could be considered for years to come. The counties of the State known as agricultural counties are the most persistent applicants, particularly those of South Jersey. The county of Essex, comprising the city of Newark and the growing suburban towns of the Oranges, Bloomfield, Montclair, Belleville, Franklin, Verona, Caldwell, Summit and Milburn, and the county of Morris, consisting of Morristown, Madison, Chatham, Dover, Boonton, etc., are also large beneficiaries of this fund. The county of Union, comprising the cities of Elizabeth, Plainfield and Rahway, and the towns of Cranford, Westfield and Roselle, have benefited in a small way only from this fund. The counties of Hudson and Bergen, with their large and influential cities and towns, have never applied for State aid, nor have the counties of Warren and Sussex, in the northern part of the State. The use of the State aid fund is received as follows: Upon the application of the property owners along the highway desiring the improvement, to the Board of Freeholders of the county, they (the Board of Freeholders) cause a survey to be made and the approximate cost to be defined. If the Board of Freeholders approve the application, it is sent to the State Road Commissioner, endorsed thereon, and, having received the commissioner's approval, the Board of Freeholders invite public competition and award the contract to the lowest responsible bidder. An inspector is named by the Board of Freeholders, and having been approved by the commissioner, the work is put under way, the cost of the same when completed

being apportioned as follows: 10 per cent. to the property owners, 23 1-3 per cent. from the State aid fund, and 66 2-3 per cent. from the county.

In Northern New Jersey are to be found immense dumps of waste iron ore rock (granite), some of which has been accumulating for the past fifty to seventy-five years. As this is the basis of this article, suppose we take a day off, starting at Dover, one of the principal towns of Morris county, New Jersey, and stopping place of all the trains of the new "Lackawanna" system. Hiring an all-day team, hitched to a buckboard, we start off, heading for Port Oram, a twenty-minute drive.

At this point is the Hurd mine, owned and operated by the New Jersey Iron Mining Company, and under full headway. Here is found Railroad Stone-Crushing Plant No. 1, of the Forman Stone Supply Company (mate to accompanying sketch), with a capacity of 200 tons per day, crushing rock for ballast (from the 50,000-ton dump) for the Central Railroad of New Jersey. Going through the town, we pass by the Port Oram furnace, owned by Joseph Wharton, of Philadelphia, of which Mr. Edward Kelley is superintendent, with its capacity of 150 tons of pig iron per day, soon to be supplemented by a 450-ton plant, to be operated by same parties. Pass the Old Orchard mine, near the station, and the Bull Frog and other mines near Mt. Pleasant, until we come to the Mt. Pleasant mine itself. At this point, for many years, iron mining on a large scale was carried on, in the latter years by the Mt. Pleasant Iron Mining Company, of which Mr. Benjamin Nicoll is president. It is now abandoned. The increased cost of deep mining and the large body of water to be taken care of made it unprofitable. At this point have been erected, by the Forman Stone Supply Company, of Newark, N. J., a large stone crushing and electrical separating plant, with an output of 500 tons per day. The waste rock to feed this immense plant is taken from the 30,000 tons now there and from all the other mines for ten miles in every direction, close railroad connections having been made with the Mt. Hope Mineral Railroad Company, the "Lackawanna" line, and the Central Railroad of New Jersey. When crushed they deliver the stone on these lines to every railroad point touched by the railroads, about 500 miles in length. The immense amount of material taken away or under contract to be crushed and taken show that the undertaking of the utilization of these waste products can be made profitable.

Taking our buckboard again we head for Heardtown, near Lake Hopatcong, a few miles away. At this point is the old Heard mine, abandoned last year, and said to have the deepest shaft in New Jersey, some 6,000 feet on the incline and 2,600 feet vertical.

This mine is now having a new shaft sunk on an old vein, which promises good results, and it is likely that she will soon gain all her old-time prestige.

There is at least 150,000 tons of waste rock here, owned also by the Forman Stone Supply Company. Some of this runs high in iron and will soon be sent to the electrical separating plant at Mt. Pleasant.

A little further on are found the Weldon, Hecksher, Dodge, Ford, Scofield and other mines, all known to history. With the revival of the iron industry some of these are being opened up, and the rest are likely soon to be

opened. There is perhaps 100,000 tons of waste rock here, the most of which is controlled by the Forman Stone Supply Company. If we had time we would ride a little further out to Edison, where, as is well known, Thomas A. Edison has erected the largest and most complete iron ore concentrating and electrical separating plant in the world, costing millions of dollars. But we have not the time, and so retracing our steps we return to Mt. Pleasant and ride a few minutes up another valley to the Richard mine, with its three openings, controlled by the Thomas Iron Company, of Pennsylvania, estimated output last year 100,000 tons, and now running to its full capacity. At this point there is perhaps 50,000 tons of waste rock on dump. A little further on is found the Allen and Thebaud mines, formerly operated for many years by the Glendon Iron Company, lately bought by Joseph Wharton, of Philadelphia, who may reopen them.

A half hour's ride brings us to the Mt. Hope Mining Company's property, consisting of perhaps 1,000 acres and valued at \$1,000,000. Formerly owned by the Lackawanna Iron and Coal Company, it has lately been sold (so understood) to the Empire Mining Company, who will reopen the mine. They are at present working the mines at Oxford and Oxford Furnace. In its palmy days, Mt. Hope was a thriving village, employing 600 people. Its output of iron ore was enormous. Idle for seven years, it would be a grand thing for that section if it were in "full swing" again. Here are at least 150,000 tons of waste rock, all of which is being taken away as fast as possible by the Forman Stone Supply Company for its stone crushing plant at Mt. Pleasant. Driving across the country we soon reach the Wharton mine, owned by Joseph Wharton, of Philadelphia, and Port Oram Furnace, in full operation night and day. Mr. Wharton controls mine, railroad and furnace. At this point is perhaps 200,000 tons of accumulated waste rock. Taking a five-minute drive down the valley on the other side we come to the mines operated by the Andover Iron Company and the Glendon Iron Company, the latter lately bought by Joseph Wharton.

Here is also the Glendon concentrating plant, bought also by Mr. Wharton from the Glendon Iron Company, and now being overhauled for early use. At this point, known as Hibernia, are perhaps 100,000 tons of waste rock, all of which can be shipped out via the Central Railroad of New Jersey. Continuing on through the valley we pass the Beach Glen mine, soon to be overflowed, as part of the reservoir system of the Jersey City Water Works, and after a short drive we are at the starting place of the morning.

We have seen mines in operation or soon to be worked, representing millions of dollars of capital, and perhaps 1,000,000 tons of waste rock, considered worse than useless a few years since, now by modern methods to be utilized in the improvement of the highways of New Jersey.

Among the purposes for which this rock has been lately used are concrete for the Lawyers' building, Telephone building, Newark Gas Company, Richardson factory, Anheuser Busch and other buildings in Newark; the Edison factory in East Newark, the New Jersey Zinc and Iron Company at Franklin furnace, and other buildings; for asphalt, brick and granite work in Newark, Jersey City and Paterson; the trolley line between Westfield and Elizabeth, and macadam work at Montclair and elsewhere.



A RAILROAD STONE-CRUSHING PLANT.

The sketch accompanying this article represents Railroad Plant No. 2 of the Forman Stone Supply Company, of Newark, N. J., crushing cobbles in the city of Newark under a two-year contract. This material is also used for concrete for the asphalt, granite and brick pavement and patent sidewalk and concrete flooring for inside of buildings of all kinds.

As it is a new invention in stone crushing, a brief description might well be coupled with this article. The small car shown is the tender to carry the coal supply for the boiler in the car attached. The other cars are fastened together in the center, securely, making one car in appearance. These cars are all supported underneath by heavy braces, to carry strain of weight and vibration when running. The car next to the tender contains the boiler and engine, and weighs, when loaded, about twenty-five tons. The other car contains crusher, elevator, hoisting engine, etc., and weighs about thirty-five tons when complete. On these two cars at the center is shown an upper story. This contains the sizing screen and separating boxes for the crushed stone, generally made in three sizes, coarse, medium and fine. Here also is the belt that carries back to the crusher stone broken too coarse at the first operation. The operation of the plant is as follows (it being understood that the crushing machinery is in full operation all the time, the engine and crusher running at about 300 revolutions): The material to be crushed is brought as close as possible to the plant. By a signal to the engineer the bucket shown is dropped to the ground, and loaded, and upon another signal being given the hoisting is quickly done, the tightening of the steel rope bringing the loaded bucket to the mouth of the crusher. Two men, one at each side, trip the bucket directly in the crusher. This repeated again and again tests the capacity of the crusher, estimated at twenty tons per hour, or 200 tons per day, to the utmost. As has been said before, a similar plant is at work at the Hind mine, at Port Oran, N. J., crushing the mine rock for the Central Railroad of New Jersey for ballast and also for macadam for the Westfield and Elizabeth Street Railroad Company, now being built between Plainfield and Elizabeth. These plants have already attracted a great deal of attention from those engaged in the stone crushing business. They are now controlled under patents by the Forman Stone Supply Company, as they are likely to be for years to come. Wherever there is a heap of stone or a quarry along the line of a railroad these machines can be sent on their own wheels, and in forty-eight hours' time can be put in operation.

Calls have already been made for these machines in many parts of the country, and their success is already assured. In the trip taken in the first part of this sketch, much has been seen worthy of a fuller description than here given, but this and other kindred topics must be reserved for another article.

C. E. McDOWELL.

Newark, N. J., September, 1899.



A STRIKING MEMORIAL CROSS.

SCULPTURED memorials in no form are held in more deserved esteem than the cross. There is every reason why this should be so. Its strength and simplicity of outline scarcely permit of trivial ornamentation, and this fact, of itself, commends it to those of correct taste. It is needless in this connection to speak of its religious significance as the most sacred symbol of Christianity. But the cross

was also in use as an emblem, having certain mystic and religious meanings, long before the Christian era, and the Spanish conquerors found it an object of religious veneration among the natives of Central and South America. With its appearance in so many different countries, and its application to so many purposes, the cross has assumed almost countless forms. In heraldry alone, in which the cross has always been greatly esteemed, there are hundreds of different modifications.

One of the favorite forms of the cross for monumental purposes has, perhaps, an origin more closely connected with Paganism than Christianity. It is a development of the old Scandinavian or Danish cross, and it became most familiar from the splendid specimens that were erected in the Island of Iona and in Ireland. The general name given to this variety is the Celtic cross, although it was not the sole creation of the Celtic race. Some of the most beautiful modern memorials have taken this form, and the editor of STONE presents this month an exquisite creation from the studios of Harry Hems & Sons, of Exeter, England.

From the accompanying illustration the grace and beauty of this monument will readily be seen. The general style of the ornamentation is true to the best traditions of Celtic art. The ancient Celts first fell under the influence of the Phoenicians, and then were moulded by the artistic methods of the Romans. Finally there sprang up an important indigenous style, based upon the designs of braided work, which was neither exclusively Celtic nor Germanic, but common to all the lands of the north. This plaited work took the place among the northern tribes that textile ornamentation had in Mesopotamian and Arabian art. It became the most characteristic pattern of the North, appearing first in wood carving and then in the stone sculptures of monumental art. It will be seen from the engraving what skilful and appropriate use the Messrs. Hems have made of the braided ornamentation. The memorial is richly carved from Robin Hood stone, a beautiful variety of sandstone found in Yorkshire, England, and is erected in Bradninch Churchyard.



QUARRY LEASES.

AS far as we are aware no figures have ever been compiled that would show the number of quarries in this country that were the property, in fee simple, of the companies working them. There are, of course, scattered instances where isolated deposits of marketable stone, occurring on land valuable for agricultural or for sentimental reasons, are worked on leases or royalty, but the number is extremely few in comparison with freehold quarry properties. There is undoubtedly a growing sentiment among large landholders in America to retain their holdings of real estate, and to draw incomes from ground rents, but so far this is found only in the cities. At any rate, the time is not in sight when this will interfere with the free working of quarries.

In Great Britain, however, where land is guarded as the most priceless of all possessions, quarry leases form one of the most important features of the stone producing industry. The following article on the subject, from "The Quarry and Builders' Merchant," will have a general interest in this country. The writer says:

"The clauses and stipulations in leases of quarries in England, Wales and Scotland, vary materially, owing to the different minerals leased, whether quarries have been worked or not, local situation, means of transport, and the diversity of views and practice of mineral engineers. A precise account, therefore, of such clauses and stipulations cannot practically be stated, but we purpose giving the ordinary and more important of them, after having first examined the leading precedents contained in quarry leases published in England and Scotland.

"After the names of the parties to the lease are stated, it is provided that, in consideration of the rents and royalties reserved, and of the covenants and agreements by the lessee contained in the lease, the lessor demises to the former, the quarries, delphs, pits under certain land particularized and delineated on the plan on the back of the lease, for a certain term of years, together with all houses, sheds, warehouses, cottages, and buildings, erections, heap-room, pit-room, store-room, yards, land rights, and appurtenances to the said quarries. And with liberty for the lessee, his executors, administrators, and assigns, to use the present, and sink, drive, and make new, and other pits, shafts, levels, dams, embankments, drains, watercourses, and other works, for effectually working the minerals and quarries, and to use and repair the present, and to make, and from time to time repair any new or other roads or ways in, upon, and over any of the lands previously mentioned, and to erect, build, and take houses, sheds, warehouses, cottages, buildings, gins, engines, pumps, erections, heap-room, pit-room, and store-room, and generally to make and do all other acts and things necessary or convenient for well and effectually working, getting, dressing, making marketable and carrying away the minerals leased. In several Scotch leases liberty is given to the lessee to stock the minerals and other produce to be gotten under the lease, and all earth and rubbish which shall be thrown up in carrying on the works upon

any convenient part of the lands leased. He is also to be entitled to remove all such minerals and other produce, earth, and rubbish between the quarries and pits and the public highway by the road covenanted to be made by him. He is also permitted to lay down such railways and tramways with proper sidings and other conveniences as may be necessary or convenient for carrying any of the aforesaid minerals, produce, earth, and rubbish between the quarries and a certain railway. Liberty is, however, reserved for the lessor, his heirs, and assigns, and his and their servants and tenants, to pass and repass at all reasonable times through, across, and along the ways and roads now made or hereafter to be made upon the land leased, except along the line or lines of any such railway or railways, with or without horses, cattle, carts, or carriages. The lessor, and his heirs, assigns, and his and their agents and workmen, are also to be at liberty to enter into and upon all or any part of the quarries, pits, and lands at all reasonable times, to inspect the state and condition thereof, and if any of them shall be found to be carried on in an improper manner, to give notice in writing to the lessee or his agent to rectify such improper working within ten days after such notice shall have been given, within which time the lessee shall, so far as practicable, rectify the same. The rents and royalties payable for the minerals gotten vary materially. Thus in a lease of stone quarries and chalk and sand pits published in Prideaux's 'Precedents in Conveyancing,' 17th Ed., 1899, the following rents are payable by the lessee, viz.: Firstly, the yearly rent of £200 to be paid during the whole term by equal half-yearly payments; secondly, the royalty or sum of sixpence for every ton of stone above 10,000 tons which shall or may be gotten from the leased land in any year of the term thereof; such royalty to be paid on a specified day in each year in respect of the stone gotten during the preceding year, and to be in addition to the before-mentioned yearly rent of £200; and lastly, the annual rent of £20 is to be paid for each lime-kiln beyond five which the lessee shall erect on the leased premises for converting the aforesaid chalk into lime, to be paid half-yearly during the term.

"In the form of a lease of lime quarries published in Davidson's 'Precedents in Conveyancing,' Vol. V., Part 1, 3d Ed., 1876, the first payment is a yearly rent of a certain sum payable half-yearly during the term for a specified number of tons of limestone, spar, and other minerals (except lead ore) gotten from the demised quarries, or converted into lime or otherwise converted or manufactured for sale, whether such quantity shall be yearly gotten and sold, removed, converted, or manufactured or not. A further specified sum for every acre used is also payable half-yearly as surface rent, except the lands actually destroyed or made waste by getting and taking the limestone spar and other minerals therefrom. There is also a royalty payable of a certain sum per ton reserved, which is also payable half-yearly for these minerals gotten above the aforesaid quantity of such, and also a royalty of one-sixth of the lead ore raised.

"In the lease of a Freestone Quarry in Scotland, published in Vol. I. of 'Juridical Styles, Heritable Rights,' 5th Ed., 1881, which contain the leading conveyancing forms in that part of Great Britain, the rents and royalties payable by the lessee are firstly a fixed annual rent, or in the option of the land-

lord a certain royalty for every square yard of surface ground wrought or broken upon, not being wrought to a greater depth than a specified number of yards from the surface, and if the freestone is wrought to a greater depth than this from the surface, an additional specified royalty is to be paid for every cubic yard of rock wrought down to any further depth, and which fixed or optional rents or royalties to the extent of a sum named is to be paid half-yearly in advance during the currency of the lease, and the balance, if any, of the amount above this fixed sum is, at the end of the lease, to be paid to the lessor or his legal representatives. Then follows a declaration that if the lessee or those entitled under him in any one year breaks a larger surface of ground than he can work that year, to the depth of a fixed number of yards, he may work it out during the next succeeding year of the lease, the royalty required therefor being payable at the first term of Whitsunday or Martinmas, after the same shall have been wrought to the certain depth agreed upon, not later than the end of the year allowed for working it out to that depth.

"The rent and royalties payable for working slate quarries as stated in the before mentioned volume of Davidson's 'Precedents in Conveyancing' are numerous and peculiar. In the first place the lessee is to pay during the first year of his lease a certain fixed rent for one thousand tons of slate (except roofing slate), whether such quantity shall during that year be gotten or sold and disposed of or not, and for all slate (except roofing slate) which shall during this first year be gotten and sold or disposed of over and above that quantity, and not exceeding the further number of one thousand tons, a certain sum, and for every ton of such slate exceeding two thousand tons, and not beyond the further number of one thousand tons, another fixed sum, 'and for every ton of this slate above three thousand tons, another fixed sum.' For the second year a certain rent is reserved for one thousand and five hundred tons of slate (except roofing slate) 'whether such quantity shall during such second year be actually gotten and sold or disposed of or not, and for all slate (other than roofing slate) which shall during such second year be actually gotten and sold or disposed of over and above the said number of one thousand and five hundred tons,' the following rents: For every ton of such slate beyond such tons, and not exceeding the further number of five hundred tons, a fixed sum; for each ton of such slate above two thousand and not beyond the further number of one thousand tons, another fixed sum; and for every ton above three thousand tons a further specified sum. During the remainder of the term of the lease a further certain rent of a fixed amount is payable for two thousand tons of slate (other than roofing slate) whether such quantity shall be gotten and sold or disposed of or not, during each year of the residue of the term, and for all slate (other than roofing slate) which shall yearly during the residue of the term be gotten and sold or disposed of above the number of two thousand tons, and not more than the further number of one thousand tons, an additional fixed sum. And for every ton of such slate over three thousand tons another fixed sum.

"As regards roofing slate further sums are payable equal to one-eighth part in value of all the roofing slate which shall in each year be gotten and sold and disposed of, the value of this slate to be taken at and accounted for according to the actual prices for which such slate shall be sold.

"With respect to the payment of the several rents and royalties reserved, these are to be paid clear of all deductions on the days mentioned, on all the roofing and other slate in respect of which any of the rents and sums before mentioned shall become payable, as shall be shipped at a named port 'on the days on which the same shall be so shipped as aforesaid, and on all such of the said roofing and other slate in respect of which any of the rents or sums aforesaid shall become payable as shall not be shipped as aforesaid on the days on which the same shall be removed from the quarries, where the same shall be raised or gotten, except that if in any year of the said term the number of tons of slate (other than roofing slate) actually gotten and sold or disposed of shall be less than the number of tons on which rents or sums of money are hereby reserved and made payable, whether actually gotten and sold or disposed of or not, then in every such case the rents or sums of money so reserved and made payable and which shall not have been previously paid in respect of slate actually gotten and sold or disposed of, shall be paid on the last day of the year, for which the same shall have been so reserved and made payable.'

"There are many important covenants in quarry leases, and particularly by lessees. These parties usually covenant for themselves and their legal representatives to make the new road referred to as quickly as convenient at their own cost, and in a workmanlike manner, to the satisfaction of the lessor or his agent, and to keep the same in good and substantial repair and condition during the said term, and also to permit the lessor and all persons authorized by him to use this road, either with or without horses, cattle, carts, or carriages.

"The lessee further covenants to pay during the term the before-mentioned rents and royalties reserved, and at the times and in manner aforesaid, and also to observe and perform the provisions afterwards contained in the lease, which are or ought to be observed and performed on his part.

"Beyond the rents and royalties reserved, the lessee generally binds himself to pay all taxes, rates, assessments, and impositions which shall be charged, assessed, or imposed upon the demised premises, or upon the owner or occupier thereof, except the landlord's property tax.

"To ascertain the amount payable by the lessee for royalties for stone gotten, the lessee is after a certain fixed date to keep proper books of account showing the amount of stone or other mineral gotten from time to time under the authority of the lease, and shall before a certain stipulated date, and in every subsequent year of the term, deliver to the lessor or his agent a correct abstract of these books of account for the then preceding year, and shall verify the same by statutory declaration of himself or his foreman, if required, and shall allow the lessor or his agent, at all reasonable times, to inspect such books of account and to take extracts therefrom. The lessee further covenants during the lease to keep all cottages, sheds, buildings, lime-kilns, and other erections then standing, or which shall afterwards be set up, in or upon the lands under the authority of the lease, in good and substantial repair and condition, and deliver up the same in such state to the lessor at the end of the term.

"The lessee covenants to effectually fence and guard the quarries, pits,

railways, tramways, and other ways then existing, or which shall at any time during the term of the lease be made under its authority, and shall do as little damage or injury as possible to the surface of the lands demised, in the exercise of the liberties granted by the lease, and shall fully satisfy the tenants of such lands for any damage or loss which may be suffered by them in consequence of any horses, cattle, sheep, or other animals falling into or getting on the aforesaid quarries, pits, railways, tramways, or other ways, or otherwise by the neglect or default of the lessee, or his agent, servants, or workmen.

"There is a further covenant by the lessee to carry on the quarry works in a proper and workmanlike manner, and after the best and approved method of carrying on similar works in the neighborhood.

"There is often in Scotch leases of quarries a covenant by the lessees to prevent as far as possible the servants and workmen in their employment from trespassing on the grounds of the farm in the vicinity of the quarry, or on any part of the lessor's lands in search of game, or for any other purposes, and from injuring the plantations on the estate of the lessor, and if required by the lessor, the lessee is to dismiss any person or persons who shall be found so trespassing.

"Moreover, the lessee is not, during the last year of the lease, to remove or destroy any machinery or plant being on the aforesaid land, and used for the purposes of the works authorized by the lease, without the consent of the lessor, but shall keep the same on the land, or in or about the works, to enable the lessor to exercise the option of purchasing the same thereafter conferred on him.

"If, at the expiration or sooner determination of the lease, the lessor shall be desirous of purchasing all or any of the machinery and plant in and upon the aforesaid land, which shall have been provided by the lessee for the purposes of the quarry, and the lessor shall signify his desire in that respect by a written notice to the lessee within one calendar month after the determination of the lease, then the machinery and plant referred to, or such parts of the same as the lessor shall choose to purchase, shall be left by the lessee and taken by the lessor at a price to be determined by arbitration in case of difference.

"In Scotch leases particularly there are stipulations that the buildings at the end of the lease erected by the lessees at the quarries, except engine houses, lodges and weighing machines, which may be removed by the lessees, shall become the property of the lessor without any payment for these buildings to the lessees. There are also other stipulations in these leases that the lessee shall be allowed twelve months from the expiration of the lease to remove the machinery, engine-houses, lodges and weighing machines, and to put the ground damaged by their operations into an arable state, the lessee always remaining liable for damages until the ground broken up or injured by him shall be put into such a state.

"There is a stipulation in all the most approved quarry leases that the lessee shall not assign or underlet the land on which the quarries are worked, or any part of the same, without the written consent of the lessor.

"The lessor covenants with the lessee that on the latter paying the rents and royalties reserved, and observing and performing the covenants and con-

ditions contained in the lease, and on his part to be observed and performed, shall quietly hold and enjoy the premises demised without interruption during the term of the lease by the lessor or any person rightfully claiming from or under him. The lessor also covenants with the lessee that the latter may at any time within six months after the expiration, or sooner determination of the lease, remove and carry away and convert to his own use all the machinery and plant which shall have been provided for him for the purposes of the quarry works mentioned, and which the lessor shall not have bought under the power given to him.

"Among the general provisions in leases of quarries, the one containing a power of distress is a leading one. Under this power it is provided that if the rents and royalties reserved by the lease or any of them shall be unpaid for twenty-eight days next after any of the days wherein the same ought to be paid, then as often as this shall occur the lessor may enter into and upon the quarries and premises demised, or any lands which shall for the time being be possessed or occupied by the lessee for the purposes of this lease, and may distrain all or any of the quarry material, horses, engines, machinery, tools, implements, chattels and effects, which shall be found in or upon the premises thus entered upon, and the same deal with and dispose of according to law in the same manner as landlords may for rent in arrear, and all costs and expenses caused by the non-payment thereof shall be fully paid and satisfied.

"Again, if the rents and royalties hereby reserved, or any of them, or any part of such, shall be unpaid for sixty days after any of the days whereon the same are agreed to be paid, or if the lessee shall commit any breach of the covenants and conditions contained in the lease, and on his part to be observed and performed, or any of them, in any such case the lessor may at any time thereafter re-enter into and upon the quarries and premises leased or any part thereof in the name of the whole, and the same have again and enjoy as of his former estate.

"The irritant clause in Scotch leases provides that if four terms' rent shall at any time be due and unpaid, the lease shall, in the option of the lessor, become void, and the lessee shall not, if his lessor shall so choose, purge the irritancy by payment.

"The arbitration clause is an important one. It is stipulated in this, that if any dispute or difference shall arise between the lessor and the lessee respecting the value of the articles and things which the lessor shall choose to take or retain as before stated, or the amount to be paid by the lessor in respect thereof, or concerning any other matter or thing which it is provided in the lease shall be settled by arbitration, or respecting any clause or matter therein contained, or the operation or interpretation thereof, then the dispute or difference shall be referred to two arbitrators, one to be appointed by each party in difference in accordance with and subject to the provisions of the Arbitration Act, 1889.

"When the context allows the expression, 'the lessor' and the 'lessee' used in this lease include besides the before-mentioned lessor, his successors in title or heirs and assigns, and besides the lessee, his executors, administrators and assigns."

THE ALABASTER CAVES OF VOLTERRA.

THE town of Volterra is situated on a tableland at a height of some two thousand feet above the level of the Mediterranean, and is distant, as the crow flies, about thirty miles from the port of Leghorn. The great antiquity of the city is evidenced by the large number of Etruscan remains to be found in the Guarnacci Museum. Even in its Etruscan days the city of Volterra was celebrated for its alabaster industry. By far the greater part of the alabaster urns which are continually being brought to light in various parts of Italy can be traced to Volterra, as well as countless alabaster ornaments which served to decorate the gorgeous palaces of Roman emperors and retainers.

The genuine alabaster district of Volterra is divided into two parts, says "The Stonemason." In the first are included the Pomerance Caves in the commune of that name. The two communes of Santa Luce and Castellina, separated from each other by the River Marmolaio, go to comprise the second division. The chief characteristic of the alabaster of these two communes is its wonderful purity and transparency. It is this species that is generally used in the sculpture of figures. Of the countless different kinds of alabaster the most costly is that known as "agata," an extremely beautiful yellow stone, varying in color when polished from dark amber to deep rich brown; the commonest species is that called "bardiglio," a stone of grayish color. Among the many uses to which alabaster can be put none is more remarkable than the readiness with which the rare products of the Castellina Caves lend themselves to being made into imitation coral. This wonderful invention was discovered some ten or so years ago by a Frenchman, who reaped a substantial fortune from his discovery. By means of some chemical, the exact quality of which is still a secret, the whitest alabaster can be made to take the color of the richest or the palest coral.

The most interesting, as well as the most extensive, alabaster caves are those of the Venelle, near Ponaia, in the commune of Santa Luce. These are approached by several wide mouths connecting with a network of galleries, which, like the Roman catacombs, branch off in all directions, and penetrate far into the bowels of the earth. These galleries are often six feet in height, but water, the alabaster worker's chief enemy, is frequently struck, and, unless carried off quickly, reduces their height by covering the patch with layer upon layer of limestone debris. The blocks or nodules or alabaster lie embedded in huge masses of limestone. It is the duty of the workers to pick carefully at this covering until the white nose of a block makes its appearance. Each man carries a small oil lamp, which, as soon as a supposed nodule appears, he brings close up to the shining patch, shading the flame with his hand. The fine translucence of a piece of genuine alabaster is thrown out into

startling relief, and the operator begins to pick carefully so as not to injure the prize.

The caves of the Volterra and Pomerance communes are small compared with those of Castellina and Pomaia. Their stratification and the method of excavation are similar to those of the Venelle district. The blocks, however, are of small dimensions, and only lend themselves to decorative and ornamental designs. The veined, spotted and striped nodules are generally used for vases and small statues.

GEOMETRY FOR MASONS.



OR nearly two years past STONE has been printing the admirable papers by C. H. Fox on "Practical Stone Cutting," making application of the most approved geometrical rules to the problems that daily confront the stone cutter. A recent issue of "The Stonemason," of Bristol, England, has an article under the above heading that deals with the use by masons of the elementary rules of this science. The writer says:

Although the simpler operations in preparing blocks of stone for building purposes may be performed by a careful use of the tools provided, none of the intricate forms required in the details of architectural construction can be successfully worked out or produced with certainty so as to avoid the clumsy wasting of material without application to the elementary rules of geometry. The square, the straight edge, will, indeed, enable the mason to reduce his blocks to level faces, and to render these parallel or rectangular, as may be desired, but they will not enable him to strike out correct curves, to determine the alterations produced in regular or irregular figures by their transference to planes at various angles. For these, and indeed nearly all the problems he will be required to solve in working out each portion of the general designs upon the individual block, the mason must refer to the rules of practical geometry; and in proportion to his own practical acquaintance with them will he be able to apply, and, if necessary, combine them, so as to arrive at the particular solution he requires. For measuring and laying down angles the mason uses a bevel, which consists simply of two legs or sticks, jointed in the manner of a two-foot rule, but so that each leg may pass freely over or within the other, and thus form acute or obtuse angles with it. They should work rather stiffly, or have a clamp screw for fixing the bevel to any desired opening without danger of disturbance. Some bevels are furnished with an arch, on which the degrees of the circle are graduated, and by which any desired angle may be correctly ascertained. Besides the compass for describing circles, the trammel is a useful instrument, by which the mason describes ellipses for arches, etc. This consists of two pieces of wood fixed together at right angles to and crossing each other. These have slits cut nearly throughout their whole lengths, in which two pins or studs, attached to a separate stick or piece of wood, may be moved along. The studs are capable of adjustment in their relative positions on the piece to which they

belong. A pencil or pointer at the other end of this piece will describe true ellipses, the proportion of the axes of which depends on the position of the studs. Besides the square for setting out right angles up to 2 feet or 3 feet in length of side, the long square or level is used in trying long lines. This is provided with a plumb bob, or weight of lead or brass, etc., suspended by a string, for indicating when the upright part of the level is vertical, and the long frame, which is fixed truly at right angles with the upright part, is consequently truly horizontal or level. This instrument is sometimes furnished with a spirit level, by which a horizontal level may be ascertained independently of the plumb bob. For testing the uprightness of the work a plumb bob is used, which consists only of the bob or weight, suspended by a string from the top of a strip of wood. This strip is of exactly parallel width throughout, and the point of suspense of the bob and the gauge mark below are exactly in a line with each other, and equidistant from the edges of the strip. Particular sectional forms, to which many blocks have to be prepared, are the most readily and truly multiplied by using moulds or templates. Zinc is a very suitable material from which to cut these templates. An exact correspondence in form of the surfaces which, when combined, are jointed together, and requiring to coincide, is thus secured, the only thing necessary to secure this being that the mason shall mark the outline of his template or pattern correctly upon the leveled surface of the block, and direct his chisel accordingly.

PRACTICAL STONE-CUTTING.*

Chapter XXI. Plate 20. Diagrams, etc., showing the practical application of the moulds and Templates, as required in order to work the piece of coping, the plan, etc., of which is given in Plates 15-19.



AVING selected a stone of the required size as given in the figures of the above-mentioned plates, work the top, bringing it to a "plane surface;" then gauge the stone to the desired thickness (in this example 11 inches), and in like manner form the under working surface. If the "planer" be made use of to cut these surfaces, then at the same time the side, as N-O-Q-H, of Fig. 2, may be cut, at right angles with the top working surface. If the surfaces in question are cut by "hand," then drafts as shown in N-O,-T-D, and H-Q., of Figs. 2-3, to the direction given by the bevels Nos. 1-2-3, need only to be worked, cutting first the drafts at N-O, and H-Q., a line as N-T-H, joining N-H will give the plane of the draft required at T-D.

This done, take the bed mould of Fig. 1 and apply it to the top surface in such a manner that the ordinate T-T' of the mould may be exactly over a line, as T-T' of Fig. 2, which may be drawn at right angles with the side; or as the case may be with the line N-T-H.

Care must be observed in the application of the mould so as to have the point represented in F of the joint surface, Fig. 2, fill the pattern. In some cases the angle of the joint bevels, Nos. 2-3, will be greater than that of a right angle, that is, obtuse angles; it therefore follows that the joint surfaces

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will not be square with the top working surface; and the points represented in F-G of the lower joint will in a manner project beyond that of the points D-E, in relation to the top surface. However, the distance at which to set back the joint line may be readily found in this simple manner: Refer to Fig. 5; there let B-D represent the height of the coping; draw B-C square with A-B; then draw D-C parallel with A-B; the length given in D-C is that which the joint line N-N" requires to be set back from a line through F or G of Fig. 2, which may be drawn square with the top surface.

Having placed the mould in the position desired, mark upon the top surface of the stone the direction as given by the joint lines N"-N, P'-P, together with the curve lines N"-T'-P', N-M-P, of the mould. Now to cut the lower joint surface: Take the bevel No. 2 (the construction of which is shown in Fig. 3 of Plate 19) and applying it as shown in the diagrams of Figs. 2-3, noting the blade of the template is applied directly over the line N-T-H drawn at the surface of the stone. To its direction draw the line N-O., this together with the line N"-N given by the bed mould, gives the direction at which to form the plane surface of the lower joint. Having cut the joint surface, take the bevel No. 4, and placing the blade of the template to the arris line D-N of the joint, to its direction mark the curve line D-F-O., of Fig. 2.

In the same manner to the direction given by the bevels Nos. 3-5 together with that of the joint line P'-P, may the upper joint surface be worked. Now to the direction given in D-F of the lower and I-H of the upper, mark upon the joint surfaces the section of the coping, noting that if the stone has been brought to its proper thickness, the points D-G of the lower and H-K of the upper sections will meet respectively the top and under working surfaces of the prism.

Now take the "plumb bevel" (constructed as shown in Fig. 3, Plate 19) and apply it as shown in Figs. 2-3, and to its direction mark the plumb line T-D. Then at the under working surface, from the point given in D, mark a line "out of wind" with that given in T'-T of the top surface. Now take the bed mould and apply it to the under surface in such a manner that the line T'-T of the mould will fall exactly over the line just "twisted" through at the under surface, when the points O,-K' of the joint lines of the mould coincide with the similar points as given by the joint sections. An inspection of the diagrams, Figs. 2-3, will show what is meant. It may again be noted that at the application of the mould to the under surface the portion comprised within N'-N-O-O' of the mould will project beyond the lower joint surface. If the joint surfaces have been cut correctly, the lines O.,-O, and Q.,-Q, of the moulds will coincide with the arrises given in O.,-O, and Q.,-Q, of the diagrams. Having placed the mould in its proper position, mark upon the lower surface the curve lines O-M-Q and K-T-O of the mould. The direction is now given at the top and under surfaces at which to form the cylindrical faces of the coping. Then having worked these, the direction as shown in Fig. 4 is given in D-I-F-I-K' at the convex and E-G-H-I of the concave face, at which to apply the moulds developed for the faces in question. To their direction, as explained at preceding plates, may the stone be brought to the desired shape.

C. H. Fox.

PLATE 20.

FIG. 2.

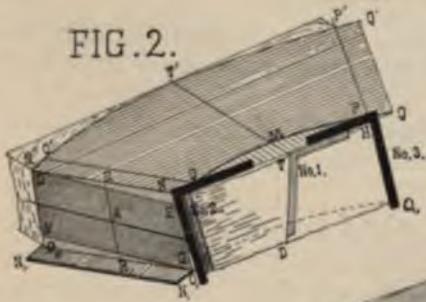


FIG. 3.

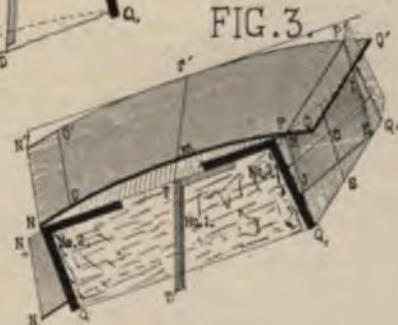


FIG. 5.

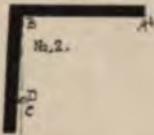


FIG. 6.

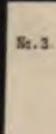


FIG. 4.

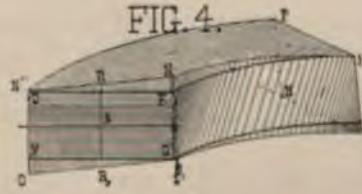
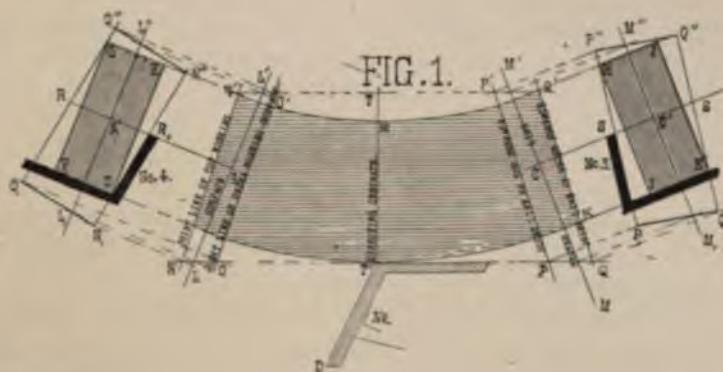


FIG. 1.



CONSTRUCTION OF STREETS AND BUILDINGS IN BRESLAU.

C. W. Erdman, United States Consul to Breslau, Germany, has sent an interesting report to the State Department on the above subject. Mr. Erdman says:

"The law regulating the construction of houses and streets is very strictly enforced in this city, under the supervision of the Board of Public Works and city engineers.

"All new streets are paid for by the owners of property adjacent to the street, as well as the sewer, water and gas connections, upon a warrant issued by a city engineer, countersigned by the auditor. Before a new street can be constructed, the majority of the property holders on said street must petition the city government to have it surveyed and advertised for construction. The city engineer and the Board of Public Works receive bids for the same and award the contract to the lowest and best bidder, who is bound to finish the street within a specific time, and to keep the same in repair for five years. The property holders must deposit with the city treasury the whole amount which the construction of the street will cost, before the work commences.

"First, the sewer is dug in the center of the street, all water and gas mains laid, and every 25 feet (which is considered the width of a lot) the sewer, water and gas connections are made to main sewer, water and gas pipes, extending to the property line.

"The specifications for the construction of streets have the following requirements:

"*Asphalt streets.*—The street is dug and leveled to receive the foundation and asphalt as follows:

"Twelve inches of coarse gravel and Portland cement are well mixed upon a twelve foot square board platform. The same is mixed dry and then thoroughly sprinkled with water to make a compact mass, when it is wheeled into the street, thoroughly leveled, and left standing for two days when the weather is warm. When cold, it is left until perfectly dry and hard as stone. This foundation is then inspected by the Board of Supervisors. If it is found to be made according to specification and dry enough, the contractor is permitted to finish it by putting on two inches of asphalt, the same being thoroughly rammed and rolled. The price of a square meter (10.7642 square feet) of asphalt pavement amounts to about \$3.57.

"*Granite streets the crevices of which are filled with sharp gravel sand.*—The bed or foundation for this kind of street is first filled with irregular rock, laid by hand side by side, eight inches high; on this are scattered four inches of small, broken rocks—about the size of hen's eggs. These are well slushed with water and rolled by a steam roller weighing from 40,000 to 66,000 pounds. When fast enough, a layer of five and three-fifths inches of gravel sand is spread over the rocks and again rolled by the steam roller. Thereupon the granite blocks of six and two-fifths inches height are rammed in and the crevices filled with sharp gravel sand. Afterwards, the whole

street is covered with sand to the thickness of an inch and left standing for a week, until the sand is thoroughly slushed with water or rain, so that all crevices are filled. The price of a square meter of this pavement amounts to about \$3.45.

"Granite streets the joints of which are grouted with Portland cement."—A layer of six inches of coarse gravel and Portland cement is prepared in the same way as for asphalt streets and left standing for at least two days. After inspection of this foundation, a layer of one and three-quarter inches of sharp gravel sand is put on. When the same has been thoroughly level, pavers begin laying diamond granite blocks six and two-fifth inches in height, all blocks being of equal size. After the street is paved, it is thoroughly rammed with iron rammers (three men to each rammer), and all joints are completely grouted with Portland cement. The whole street is then slushed with Portland cement, the thickness of a slime of soapsuds, so that all crevices are thoroughly filled. It is left standing for two days before being opened for traffic. The price of a square meter amounts to about \$3.52.

"All streets have sufficient crown to make a perfect drainage to the gutters; but no gutter crosses any street, there being three sewer connections on each side in every square, which are sufficient to carry off all the surface water even during the heaviest rain. The intersections of all streets have crown enough to throw the water into the respective gutters, which lead to catch basins covered with iron gratings of about 12 by 20 inches, with one-inch openings between the bars.

"The houses have in general four stories besides the basement. The specification of the same is as follows:

"The thickness of the front walls must be: In the cellar, 32 inches; in the first and second story, 26 2-3 inches; in the third and fourth story, 21 1-3 inches; in the attic, 16 inches.

"Partition walls (which must not be over 10 meters or 32.7 feet from center to center) in the cellar, 26 2-3 inches; in the first and second story, 21 1-3 inches; in the third and fourth story and attic, 16 inches.

"Partnership walls must be: In the cellar, 21 1-3 inches; in the first and second story, 16 inches; in the third and fourth story and attic, 10 2-3 inches.

The joists must be: In the first story, 12 2-5 inches; in the second story, 11 3-5 inches; in the third story, 10 2-5 inches; in the fourth story, 9 3-5 inches.

"The building is inspected by the Board of City Engineers and the inspectors of buildings: (1) When the cellar walls are finished and before the joists are laid; (2) when the brick or stone work of the whole building is finished; (3) when the house is finished and ready to be accepted by the owner.

"The inspectors receive no fee from the contractor or the owner of the building, but they are paid by the city out of the general fund derived from taxation of realty.

C. W. ERDMAN, Consul.

"Breslau, July 22, 1899."

BONDING BROKEN ASHLAR WORK.



R. C. A. MARTIN, in a recent issue of "The American Architect and Building News," presents suggestions for masons and builders as to the face bonding of broken ashlar work that will be found of value and interest. Mr. Martin says:

If one may judge anything from architects' drawings and from illustrations published in some of our best text-books on the subject of masonry construction, there is much need for observation on the part of those called upon to make or accept such drawings. The word "observation" is used advisedly, for certainly few architects would ever allow face walls to be bonded as many allow them to be shown on drawings; and it would be an ignorant inspector indeed who would pass such work as is used to illustrate the bonding of broken or random ashlar in many of our best works on masonry construction. That we have so much really good rubble and ashlar work in this country is more to the credit of the workmen and the superintendents than to that of the men who make the drawing. However, the purpose of this article is not so much to find fault as to offer a few suggestions that may be of use in drawing, building and inspecting certain kinds of stone walls.

In speaking of bonding here, reference is made only to the bonding of face stones with one another and not to the bond in thickness of the wall, though the latter, of course, is not to be neglected as a measure of good construction. The bonding of a rubble wall offers few difficulties ordinarily, the principal requirements being to keep beds as nearly horizontal as possible and to see that vertical joints are well broken and not too long.

In coursed work the bonding is so simple as practically to care for itself; but it is with broken or random ashlar that the difficulty occurs, and the following suggestions, which have been gradually formulated from a considerable experience as a superintendent, from hints dropped by workmen, and from careful observation of executed work, both good and bad, are offered as a guide for the proper face bonding of this kind of masonry:

1. All stones should be perfectly rectangular, no re-entrant angles being allowed, as such re-entrant angles are never cut except to save a stone that has been damaged by having a corner knocked off and are, therefore, *prima facie* evidence of patchwork.

2. The horizontal dimensions of a stone should always be greater than the vertical dimension, except in the case of quoins, where it is sometimes, though not always, permissible to make the short end less than the vertical height.

3. No stone should be superimposed directly upon another stone of exactly the same length, thus bringing the end joints of both in the same vertical lines, except in the case of comparatively narrow piers, where this may be necessary to avoid the appearance of coursed work.

4. Stones should not be so laid that four corners come together at a single point.

5. The number of stones abutting upon a single vertical joint (counting stones on both sides of the joint) should usually be three or four and should never exceed five; and the number of stones abutting upon a single horizontal joint should never exceed seven.

Broken range ashlar is exactly the same as broken (or random) ashlar, except that it is laid with numerous long horizontal joints. Aside from this it should be governed by the same rules that govern the laying of broken ashlar.

GRANITE AND FOUNDATION STONES.



HE ancient Egyptians watched the effect of atmospheric and other influences on stones, and wisely profited by the lessons taught them by experience. They learned that earth abounding with niter, from its attracting moisture, had the effect of decomposing granite, but that in the dry climate of upper Egypt the stone remained for ages uninjured when raised above all contact with the ground. When, therefore, there was a possibility of its being exposed to damp, they based an obelisk or other granite monument on limestone substructions, and these last are found at the present day perfectly preserved, while the granite above them gives signs of decay in proportion to its contact with the earth subsequently accumulated around it, says "The Stonemason."

This refers to Upper Egypt, visited only four or five times in a year by a shower of rain, for in the Delta granite remains have been affected in a far greater degree than in the Thebaid; niter abounds there, and it is remarkable that the obelisks at Alexandria have suffered the least on the sides next the sea. The Egyptians seldom used granite as a building stone, except for a small sanctuary in some sandstone temple; and in the later times of the Ptolemies one or two temples were built entirely of granite. But in the true Egyptian period the use of that stone was chiefly confined to the external and internal casings of walls, to obelisks, doorways, monolithic shrines, sarcophagi, statues, small columns and monuments of limited size, and was sometimes employed for roofing a chamber in a tomb.

The durability of granite varies according to its quality. The felspar is the first of its component parts which decomposes, and its greater or less aptitude for decay depends on the nature of the base of which the felspar consists. Egypt produces a great variety of granite, and the primitive ranges in the desert to the east of the Nile, about thirty-five miles from the Red Sea, supplied the Romans with numerous hitherto unknown kinds, as well as with porphyry, which they quarried extensively in that district; but the granite of the ancient Egyptians came from the quarries of Syene, in the valley of the Nile, and from these they obtained what was used for their monuments. It

is from this locality that the name of "Syenite" has been applied to a certain kind of granite; it is, however, far from being all of the same nature, and a small portion only of the stone found there is really what we now call "Syenite."

At the early period of the third and fourth dynasties, between twelve and thirteen centuries before the Christian era, the Egyptians extensively employed granite for various purposes. They had learned to cut it with such skill that the joints of the blocks were fitted with the utmost precision; deep grooves were formed in the hard stone with evident facility, and it must have been known to them for a long period before the erection of the oldest monuments that remain, the Pyramids of Memphis, where granite was introduced in a manner which could only result from long experience. In the time of the first Osirtasen, about 2,050 years before the Christian era, granite obelisks were erected at Heliopolis and in the Fyoom, and other granite monuments were raised in the same reign at Thebes, from which we find that even then the Egyptians had learned how the damp earth acted on granite when buried beneath it; and this interesting question suggests itself —How long before that time must the stone have been used to enable them to obtain from experience that important hint which led them to place granite on limestone substructions?

SYDNEY BUILDING STONES.

UNDER the title "Some Notes on Sydney Building Stones," Mr. J. Nangle has contributed some interesting particulars to the "Engineering Association of New South Wales." Referring to rainfall, the author observes that during the year rain falls in Sydney on an average 157 days; while the rainfall for the whole year is about 49.85 inches, which is about double the rainfall of London. In Sydney the range of temperature is severe, being as much as 26 degrees in one day. In consequence of the great rainfall, he recommends that as regards stones used for building in that city, they should absorb as little water as possible; and Mr. Nangle has made several absorption tests. His method was to prepare the stones experimented with so that they should have as nearly as possible a uniform amount of surface. All the specimens were dried at 100 degrees Cent. They were then weighed and placed in water 2 feet in depth and adjusted on pin points, where they remained for twenty-four hours, when they were taken out and reweighed to ascertain the amount of water absorbed. For our own part we cannot recommend this method of testing the absorptive capacity of specimens of building stones. They should not be artificially dried, especially up to such a high temperature, for microscopic cracks are almost sure to be developed or enlarged. They ought not to be placed in such deep water, the pressure of which above them prevents the escape of air from the pores of the stone, and so brings about an erroneous result. They should rather be placed in shallow water, and have one flat surface raised a millimeter or two above the level of the water to permit the free escape of

air. And the specimens ought to be weighed at intervals within the twenty-four hours, especially during the first few minutes up to half an hour, to gauge the *rate* of percolation, which it is often more important to know than the maximum percolation. In the crushing tests, carried out at the Sydney Technical College, the author was careful to see that each specimen was dressed so that at least two opposite faces (placed between the dies of the machine) were parallel. The specimens dealt with were chiefly sandstones, but igneous rocks, such as basalt, syenite, and granite, and metamorphic, including marble (some European), and slate, all used for building in Sydney, were also tested. The syenite from Gabo Island, Victoria, withstood a pressure of 11.20 tons per square inch, while the lowest results recorded are among the sandstones, which ranged from 1.21 tons to 3.19 tons per square inch. Altogether this is a valuable contribution to our knowledge concerning the physical properties of some well-known Australian building stones.

BUILDING AN INDIAN PAGODA.*

IT is a rare thing for an European engineer to get a chance of being associated with the Eastern nations in the erection of any of their religious edifices. However, soon after my retirement from the P. W. Department, having selected Mandalay as my place of business, I had the good fortune to be entrusted with the supervision of the building operations then going on in the Mahamonie or Arrakan Pagoda, and as this is one of the stock sights of the town to which every tourist or visitor makes at least one trip, I send you a description of the work in the hope of its proving of some interest to your readers.

The image is a sitting Gaudama with crossed legs made of brass, its height being about 19 feet and width at base about 8 feet. I have not been able to find any reliable statement of the weight of the image. The Burmese legends relate that it was cast by one of the devout followers of Gaudama during the lifetime of this leader, and that he breathed into the image which enabled it to talk and walk. But before his last disappearance he forbade it to move or to open its lips until he gave it permission to do so again.

The Buddhists of Burma hold it in great veneration and make pilgrimages to the shrine from various parts of the country. Even now wonderful tales are related of cures effected or some particular prayer being gratified. It is said that one of the women in Rangoon who had amassed considerable wealth by selling fish in that town once made a pilgrimage to Mandalay, accompanied by several of her friends. Now, the fishermen of Lower Burma always endeavor to bring their fish to the markets alive, if possible; thereby they escape the sin of taking its life, and also the fish being fresh possibly obtain a better price. Then as the other Buddhist buyers of the town would not like to buy living fish, and thereby incur the guilt of killing them, this act devolves on the market women who retail the fish; and it is a common sight to see them very early in the morning belaboring the fish with short thick bludgeons,

*From Indian Engineering.

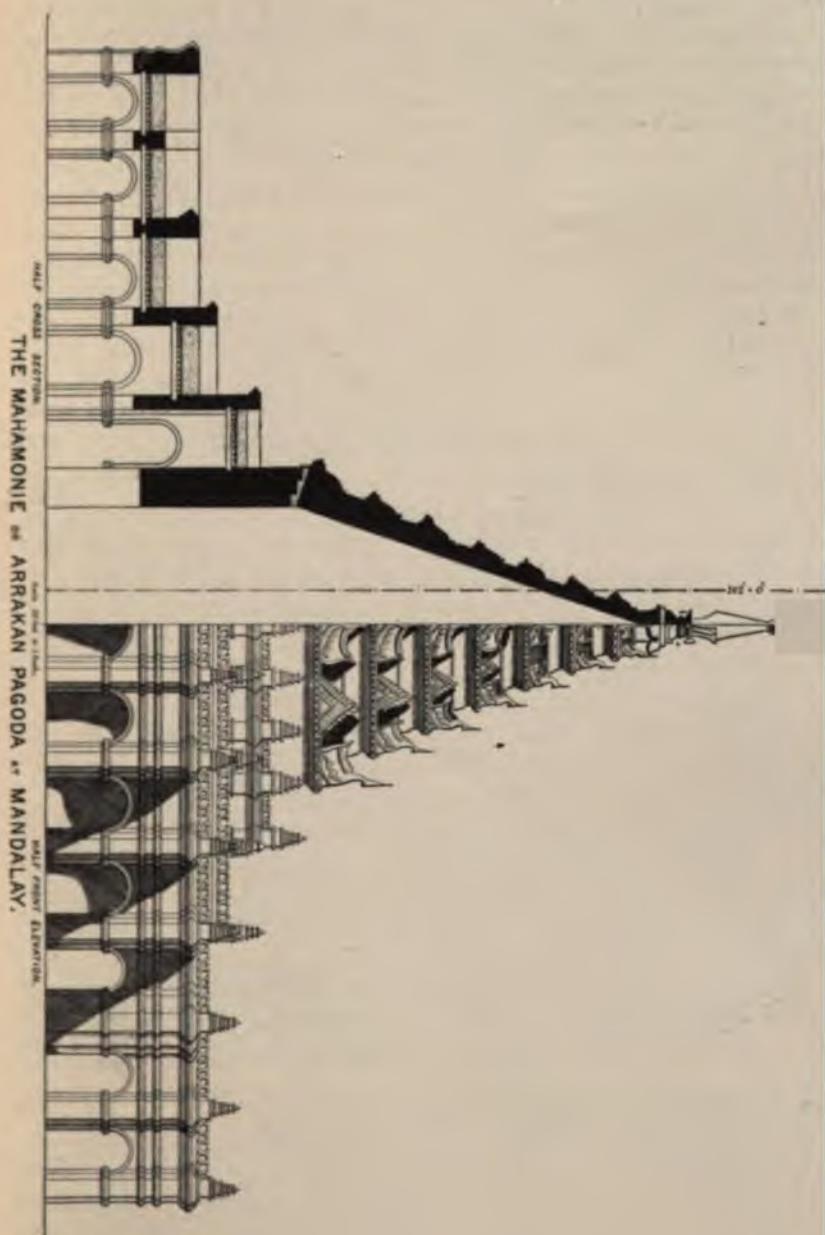
before the crush of buyers arrive. And it is surmised that this particular lady had accumulated a respectable total of guilt in this manner, so that when she and her friends knelt in front of the shrine and made her offerings and prayers, to her great surprise she could not see the image although she could see everything else quite well. This apparently gave a great shock to her mind, and it is said that promptly she took off all her diamonds and gold bracelets and made them as an offering to the image, and then cut off her hair and donned a nun's dress, and to this day she is still a nun residing in one of the edifices near the Pagoda. There are numerous other similar tales, but I am afraid you could not spare the space for their relation.

The image was originally in a Pagoda in the old capital of Arrakan, hence the English call it the Arrakan Pagoda, and during the time of King Aloungpaya, when the Burmese conquered that province, amongst other loot, they also brought away the image to Mandalay. I have taken some pains to try and obtain a reliable account of how the Burmese brought this enormous and weighty image across the most rugged and difficult country in the whole of Burma. Having been associated with the Chin-Lushia Expedition and the making of cart and mule roads in that country, I can fully appreciate the difficulties entailed in this undertaking; but, unfortunately, I can find no reliable records of this, which I consider is one of the most remarkable achievements of the Burman and stamps the race as having possessed a large amount of vigor and enterprise at that period of its history. In one account it is related that a large bamboo scaffolding was made up and the image was placed on that, and carried in toto by one thousand slaves, but I can hardly credit this; although Lieut. Rainey (now Col. Rainey, commanding 4th Burma Regiment) came across traces of a wide and old road over the hills in the Chin Bok country, which the Chins related was the track followed by the Burmese in their raid into Arrakan and back again. I am inclined to think they must have dismembered the image, and thus transported the various bits, which were again riveted together on arrival at Mandalay. It is impossible to see any traces of this now on the image itself as it is coated with gold leaf some inches thick.

The building over the image at Mandalay was originally a wooden structure, which was burnt down in King Theebaw's reign, and it has been related to me by men who were actually present at this fire that the gold leaf which is on the image melted with the heat and streams of gold matter flowed from it. Two rescue parties were formed, one consisting of Palace officials and their followers, and the other of townsmen headed by well-to-do traders, etc., and these two parties vied with each other in their efforts to subdue the fire and save the image. In their religious frenzy many heroic and brave deeds were performed, and at last their efforts were crowned with success, and the image saved, although the entire edifice was destroyed.

Some time after the English occupation, when men's minds had settled down somewhat, collections to rebuild the Pagoda were started, and by the year 1891 a sufficient sum had been collected to warrant a start being made. It was then found that there were three parties in the field. One wished to rebuild it on the old lines and of timber, a second party headed by some Burmans who had seen the Crystal Palace in England, proposed a structure of

STONE.



iron and glass, whilst the third party proposed a masonry building. Eventually an open air meeting was convened presided over by the English officials of the town, and a popular vote taken at that meeting which decided that the building should be of masonry.

The Trustees of the Pagoda then obtained a design from Mr. Hoyne Fox, A.R.I.B.A., Executive Engineer, Rangoon, which after some slight modification was approved of by the P.W.D. Secretariat; and a commencement of the building was made under the supervision of Mr. Boog, who had served as a subordinate in the Burma State Railways and the P.W.D. On the opening of the Mandalay-Kunlon Railway, Mr. Boog obtained a post on that line, and gave up the Pagoda work.

When I took over the work I found that the foundations of the four innermost wall surrounding the image had been put in, and the walls raised to more than 30 feet above the ground. I then consulted Mr. Hoyne Fox, and we decided to strengthen these walls by throwing arches across to the next outer row of walls. The four walls enclosed a square 46 feet clear, and we decided not to dome this over but to gradually contract the interior from a square to a circle by projections inwards from the four corners; and eventually at the height of 48 feet from the ground I obtained a circle 46 feet diameter on the inside, whilst the square was retained on the outside. To enable the walls to withstand the thrust due to the spire which we intended erecting above them a W. I. band plate 18" by $\frac{1}{2}$ " was riveted together, and fixed all round, and inside this plate a layer of cement concrete was laid all round, the upper surface of the concrete being placed at right angles to the slope of the inner cone. And on this concrete the cone was constructed. The spire or pyathat consists of seven terraces square on the outside, each terrace gradually lessening in size, whilst the interior surface is a cone gradually lessening the clear space inside till at the height of 114 feet from the ground the cone comes to a point and the cap is a solid mass of masonry again encircled by a W. I. band plate with a layer of cement concrete inside the plate. I had special wedge-shaped bricks moulded for the inner lining of the cone. With Mr. Fox's permission I also altered the exterior ornamentation of the terraces to be more in keeping with Burmese style already in existence in the country.

At the third terrace from the top a vertical teak post, 12" by 12", is fixed by sole plates and sheets buried in the masonry projecting above the brickwork, and in this the iron rings supporting the rings of the Htee is embedded.

It was intended to have the "Doobigat" made of brass, i. e., the neck connecting the Htee with the masonry cap, but unfortunately the Trustees entrusted the moulding of this to some Burmans in Mandalay who failed miserably. My proposal to send detailed drawings of this to some European firms either in India or England was not accepted, and I think the Trustees are now sorry they did not accept my proposal. After the Burman had failed, there being no time in which to have a new brass Doobigat made up, we made the Doobigat of iron, and had it covered over with gold leaf.

Throughout the whole work I had nothing but Burman labor employed; and I find the Burman will do good work if he sees you have made up your

mind not to accept bad work at any cost. I had to give them a couple of lessons by pulling out bad work and deducting the cost out of their pay, and I had no more bother after that. I found the Trustees very gentlemanly and courteous throughout. Soon after taking over charge of the works, I had occasion to reject some lime and bricks supplied by some of the contractors, and they promptly appealed to the Trustees against my decision. On these gentlemen asking me if I could oblige them by letting the materials pass this once, I replied I would be very happy to build the pyathat of cowdung if they wished it, and if they would give me a document relieving me entirely of all responsibility as to the quality of the materials. After this my decisions were always accepted without a murmur. The masons and workmen employed above found it necessary to wear slippers to protect their feet from the lime in the mortar, and on one occasion some Poongyees raised an objection to the wearing of shoes over the image, and consequently the work was stopped for about three weeks, as no one could be found to do the work barefooted. After this the shoe question was quietly shelved, and never raised again.

The raising and fixing of the Htee on any pagoda practically marks the completion of the work, and is always made an occasion for much rejoicing and feasting by the Burman, and naturally for such a famous shrine as the Mahamonie, the fixing of the Htee caused an excitement throughout the whole province. Gradually, as the building approached completion, an auspicious day was decided in consultation with certain astrologers, and notices were issued and widely circulated, stating the date on which the Htee would be raised. It had been the custom on previous occasions of fixing Htees to have rope connections from the ground, and to run up the Htee on this rope, but this had been a fruitful source of danger and accident, and lives have been lost at many of the Htee raising ceremonies. I therefore prevailed on the Trustees to let me run up a temporary staging, and have a car made on which the Htee could be placed, and gradually hauled up into its position. After much hesitation they agreed to this innovation, and I constructed a light staging well braced together with a set of rails laid from the ground right up to the top of the pagoda. As the staging proceeded I found considerable difficulty in getting carpenters to work on it, as at the height of 160 feet from the ground one is inclined to get giddy, and let go of your hold. However, I am happy to say the whole was completed without any accident, and it greatly added to the effect and pomp of the ceremony, because on each side of the car a set of stairs had been provided, and I allowed fifty men at a time as a safe load on the scaffolding. The Htee consisted of seven rings, and finally there was the "Seinboo," or large ball surmounting the Htee. The programme which was carried out was that the lowest ring should be run up on the first day, accompanied with a salute of fifteen guns, and one ring each consecutive day accompanied with a salute of five guns, and finally on the eighth day the Seinboo was run up under a salute of fifteen guns.

The whole place was gaily decorated, and the crowds each day were immense, consisting of representatives from the whole universe. Various booths were erected in the grounds surrounding the pagoda in which all kinds of Burmese amusements were provided, and other booths were erected in which various people received friends and visitors.

One curious coincidence occurred, which is worth noting. I had read in various Burman records accounts of ceremonies in connection with the opening of large works of public benefit, such as the construction of tanks for irrigation, etc., and in every one of these accounts it was stated that the "nâts," i. e., good spirits of the heavens, marked their approval by applause which caused the earth to tremble. And in conversation with many of the Burmese visitors during the second day of the festival, I mentioned that to be orthodox and in accordance with precedent, there should be a shock of earthquake to mark the approval of the nâts, and it happened that the next day after this conversation at about 4 a. m., a slight shock of earthquake was felt. I have not seen this shock noticed in any of the newspapers out of Mandalay, and would like to know was this a purely local tremor, and its cause? Of course the Burmans to whom I had mentioned the subject the previous day gleefully pointed out to me that the nâts had marked their approval in the orthodox fashion, and therefore their records, etc., were perfectly correct.

I am sending you one sheet of drawings giving a half cross section through the building and a half outside elevation; also a photograph showing the nât lan or staging for erecting the Htee. In this photograph the exterior of the spire is devoid of all ornamentation, as the ornamentation has only been put on subsequently after the removal of this staging.

I am now engaged on building an ornamental archway leading into the shrine. The design is a very pretty one, thoroughly Burmese, done by a Poongyee, and would really do credit to a member of the R. A. It is intended to build it of the alabaster stone found near Mandalay. I shall later on send you a copy of this design, as the archway when finished will be one of the sights to be seen in Burma.

J. DONNAN.



Comment on Timely Topics

THE LAW AND TOMBSTONE INSCRIPTIONS.

NOT long ago an American newspaper called attention to the fact that the vestry of an English church refused to allow a few lines of poetry to be inscribed upon a tombstone in the churchyard. The ground of their objection was that the verses were held to be "mere doggerel." The vestry was undoubtedly unaware of the fact, brought out by the newspaper, that the "doggerel" was from the pen of no less a writer than Longfellow, whose bust is given an honored place in the Poet's Corner of Westminster Abbey. As if to even up for this international slight, the same writer recalled the fact that another vestry board refused to permit a tombstone inscription from Tennyson, on the ground that it was sacrilegious.

The curious epitaphs that so frequently find their way into print must often cause the serious to grieve. That a tombstone is no place for jocularity, for sarcasm, for mawkish sentimentality or for grotesque exaggeration is one of those things that should be known without teaching. But it is not known, and a tombstone censor would be an overworked official in almost any community. It is a question how far church officials or cemetery directors could go in the supervision of epitaphs or inscriptions in this country. That the law would frequently be invoked is evident. With the Established Church in England, the condition of affairs is far different. A recent exchange touches on this matter, and quotes several decisions that have a general interest to readers of STONE. The writer says: It would appear from many legal decisions that, notwithstanding the powers vested in an incumbent, he has no legal right to refuse to allow an inscription on a tombstone in his churchyard of a simple and scriptural nature. Apart from the sentiment of the question it was never intended or contemplated by the Legislature that the ordinary's power to regulate the inscriptions on tombstones should be oppressively or arbitrarily exercised. Sec. 28 of 15 and 16 Vic., ch. 85, provides (*inter alia*) that any question which shall arise touching the fitness of any monumental inscription placed in any parts of the consecrated portions of the burial ground shall be determined by the Bishop of the diocese. In the case of Keet vs. Smith, L.R. 4, Adm. and Eccl. 398, and P.D. 73, the incumbent objected to the proposed inscription on a tombstone, and on application being made by the father of the deceased for a faculty, the Chancellor of the diocese and the Court of Arches refused it, but the Privy Council, seeing nothing objectionable in the inscription, directed it to issue.

The objection taken by the incumbent in this case was that the deceased was described as "The Reverend," he being only a Wesleyan minister, and as such, in the incumbent's opinion, not entitled to the prefix "Reverend." The inscription in its entirety was as follows:—"I.H.S. In loving memory of Anne Augusta Keet, the younger daughter of the Rev. H. Keet, Wesleyan minister, who died at Owston Ferry, May 11th, 1874, aged 7 years and 9 months. Safe sheltered from the storms of life." It should be remarked that no exception was taken to the latter part of this inscription.

Again in the case of Breeks vs. Woolfrey, Curt 887, Sir Herbert Jenner said:—"It was not denied, nay it was admitted, that if the inscriptions were of the character attributed to them in the citation, viz., contrary to the articles, canons and constitutions, and to the doctrines and discipline of the Church of England—no person had a right to erect a tombstone with such inscriptions impugning the doctrines of the Church of England, and that a person so offending is liable to be punished." The inscription in this case was "Pray for the soul of J. Woolfrey," and the court held that such an inscription was not illegal.

THE DEWEY ARCH IN PERMANENT FORM.

ONE of the most striking features of the reception prepared for Admiral Dewey on his return to the United States is the triumphal arch erected in Madison Square Garden. This beautiful memorial was made possible only by the patriotic efforts and untiring devotion of the sculptors, who faced the great difficulties of insufficient time and lack of adequate appropriations. The result of their work has surpassed all expectations and forms, perhaps, the most striking temporary memorial ever erected in honor of great victory. With such admirable artistic effort as have been put forth, it is only natural that the suggestion should be made in every quarter for a reduplication in permanent form of the arch. It was in this way that the splendid creation of Stanford White in Washington Square came into being. There is every reason for perpetuating the Dewey arch, and it is to be hoped that the enthusiasm of the moment may not pass away without finding record in a permanent memorial. All discussion that tends to this end is to be welcomed, and we are glad to see that the newspapers in all parts of the country, foregoing local jealousies, are advocating the plan.

It is, perhaps, rather early to speak in detail of this, but if the scheme is going through at all, it should be recognized at first that the scope of the plans should be broadened. STONE yields to no one in admiration for Admiral Dewey, and it is with no idea of minimizing the honor due to him when we say that such a memorial should be erected to one man alone, however great he may be, but rather to all of the heroes of the war, and in celebration of the victories in Cuba as well as in the Philippines. We believe that Admiral Dewey himself would wish this to be so. Monuments to a nation's victory are always excellent for the lessons they teach, quite distinct from any association

with battles and bloodshed. There are many reasons that have made it undesirable to erect great memorials of the Civil War, apart from the honors that are paid to individual commanders and from the excellent work that has been done on the noted battlefields, but here is an opportunity that will not offend the susceptibilities of any one within our borders. We are in need, too, of great artistic creations in our cities, and such memorials would serve a distinct educational purpose.

If a permanent memorial is to be erected it goes without saying that our sculptors and stone carvers will give a good account of themselves, and that their work will bear comparison with that to be found in any other city of the world. A structure of such a size as this could also be made a memorial to America's marvelous resources in the matter of decorative stones. While the main portion would doubtless be built of one material, like marble or granite, there would be opportunity for the employment of many other varieties of stone, rich in color effects, which could be made to harmonize perfectly with the whole, and would add to its artistic effectiveness.

MEMORIALS TO THE DEAD AND TO THE LIVING.

THOSE who have read the department of monumental news in recent numbers of *STONE*, must have noticed the remarkable number of monuments and other memorials that are being erected in all parts of the country to the volunteers who took part in the late war. Almost every community that furnished a regiment or a company has a monument at present under way, or is raising the funds for the construction of one. Scores of individual heroes who fell at the front have also been honored in this way. The gratitude and affection of the Republic for those who have fought its battles is an admirable thing. We trust that it will not seem ungracious, however, to utter one word of warning. Utah raised a considerable sum of money to welcome its returning volunteers in an appropriate manner. It is proposed to use the surplus from this fund for the erection of a memorial arch, and the suggestion has been made that the names of those who fell at the front be inscribed on one side of the arch, while the names of the living members and the general engagements be carved upon the other side. We believe it to be unwise, and we say it with no particular reference to this instance, to inscribe the names of a body of living men upon a memorial of this kind. While each of the soldiers may be a single-hearted patriot, there is a possibility that some one of them may so conduct himself in after life as to make his name a reproach to those with whom it is associated. The erasing of such a name from a public memorial is not as simple a matter as it may seem. It is fear of just such an eventuality as this, that makes many people hesitate before naming their children in honor of a living person. It is a hardship that survivors cannot have the same honor in this respect as those who fell in battle or died from disease, when their sacrifices and efforts may have been just as great. But we cannot change our conviction that it is the part of wisdom, as well as of good taste, to honor by name only the dead on public memorials.



The United States Marble Company, of Cincinnati, O., has purchased for \$25,000 the Cedar Bluff marble quarries, near Knoxville, Tenn., and will operate them.

The Union State quarry, one of the largest in Northfield, Vt., has been leased for ninety-nine years by Rev. Walter Cole and Prof. Charles Dole. Quarrying will be begun immediately.

The granite industry at Elberton, Ga., is booming and the quarries are being improved and developed.

There is talk of working the quarries at Dudley, Ia., again.

A. Kichner's stone quarry, at Fountain City, Minn., is now in operation and a large force of men is employed. The stone is being used by the United States Government for river improvements.

J. Laudeau has purchased a tract of land of O. Church at Middlefield, Mass., on which has been found a valuable quarry of quartz. The property is in the immediate vicinity of the quartz mill, so that it can be easily worked.

Thomas A. Kimble & Co., principal owners of the granite quarries at Lumberville, Pa., has made an assignment for the benefit of creditors to Henry S. Lear, of Doylestown. The cause of the failure is alleged to be the inability to collect bills due on a Philadelphia contract.

The Sioux Falls (S. D.) stone quarries are overtaxed and some building jobs are delayed on account of the inability to obtain the necessary stone.

The P. G. Merrill quarries at Stonington, Me., have been purchased by a Philadelphia man, who will operate them ex-

tensively. The granite at his quarry is of a fine quality and the quarry is one of the most accessible for vessels on the coast.

Columbus Oliver, working in a quarry at Addison, O., dropped some matches in the blast hole on a charge of powder that exploded and injured him severely.

More than 100 men are employed at the Keller quarry on the Tennessee river, near Tuscumbia, Ala., which is being operated by the Government. It is said that the work will continue three years, the stone to be used to complete the Colbert Shoals canal, near Riverton. When the quarries are in full operation more than 100 stonemasons will, it is said, be employed.

The quarrymen at the Watson and the Alton Lime and Cement Company quarries at Alton, Ill., struck for eight hours a day and ten hours pay, but returned to work at the old scale.

The Port Arthur route has opened a large quarry at Gilman, Ill., and purchased a rock crusher to make ballast for its roadbed. It is now placing eight carloads of the material a day.

Alfred Manger, fireman, was killed in a boiler explosion at Yoder & Son's stone quarry, near Decatur, Ind. Daniel Yoder, senior member of the firm, was fatally injured.

William Monday and Harmon Kreis, who sold their famous Cedar Bluff quarry and the large marble mills near Knoxville to the United States Marble Company, of Cincinnati, will open a new quarry not far from the one they sold.

The Rankin Quarry Company has been chartered, Vicksburg (Miss.) capitalists being at the head of it. This is the first and

only quarry company ever organized in the State, although lime and sandstone of excellent quality are abundant.

The Standard Quarrying & Construction Company has been incorporated at Trenton, N. J., to operate quarries and mines. The capital is \$1,000,000. The incorporators are: Henry E. Parson, Walter A. Roberts and Charles P. Summer, of Jersey City.

The T. A. Scribner stone quarry, at Mavvern, Ill., is rushed with orders and is getting out large quantities of stone.

Crowds continue to visit the O'Rourke stone quarry on the side of West Orange Mountain to inspect the alleged figure of St. Anne.

The Taintor granite quarry, just out of Hallowell, is reported to be developing in a highly satisfactory manner. There are about twenty quarrymen at work, while at the sheds of George Lord, in Hallowell, where the stone work is cut, there are about thirty men.

A large stone, requiring fourteen horses to draw it, was taken out of the Gregg quarry at Milford the other day.

The quarries on Granite Mountain, near Fairland, Tex., belonging to the Texas & New York Granite Company, are working hard to fill an order for crushed granite for New Orleans.

Mrs. Agnes F. Easton has brought suit against the Peckham Bros., who are operating quarries at Middletown, R. I., claiming that the blasts fired in the quarry injured her property. An agreement was reached without the judgment of the court.

The Plymouth (O.) Stone Company are working at top speed to keep up with their orders, but are hampered by difficulty in getting sufficient cars. They have shipped over 600 carloads of stone, most of which has been for bridgework for railroads. They are employing over fifty men.

T. F. Haus and Mr. Charles Anderson, of Pittsburgh, acting for a number of business men of that city, have purchased forty-eight acres of a granite ledge at South Freeport, Me., known as the South Freeport quarry. The company is also considering the purchase of the Mallet quarry. Sheds are being put up in order, and wharf privileges have been obtained adjacent to the quarry.

Hamilton & Dailey, who operated stone

quarries at Brookfield, O., have filed petitions in bankruptcy. Hamilton places his liabilities at \$8,073.12 and his assets at \$2,105, while Dailey fixes his liabilities at \$7,916.12 and assets at \$2,485.

The McDermott Stone Company, of Portsmouth, O., are making elaborate improvements at their works. They have put in an electric light plant at their stone saw mill, which is running day and night. Next summer electric lights will be placed in the quarries so that these can also be worked at night. They are also erecting dwelling houses for their employees. So many orders are on hand that the quarries will be worked as far into the winter as the weather will permit. Another large mill will be erected next spring.

The Gibbs-Houghton Co., of Columbus, O., have been buying up rock quarries and rock hills in Flint township, Ill.

Two stone quarries are running at full blast at Wilton Center, Ill.

The O'Laughlin stone quarry at Ives, Wis., is very busy, employing more than forty hands.

The Blue Springs and Wymore Stone Company, of Blue Springs, Neb., is developing its property and it is probable that switches will be put in by the Union Pacific and Burlington railroads.

Messrs. Charles D. and Walter Smith, of Birmingham, Ala., have bought a half interest in the rock quarry at Rankin, Miss., twenty miles north of Jackson, and have already secured some large contracts. They will furnish the Government 16,000 cubic yards of stone for the Mississippi river work and will send 5,000 yards to New Orleans, beside furnishing the Alabama & Vicksburg railroad with a lot of stone. They have about 200 men to work in the quarries.

Rockmen working in the Anaconda Copper Mining Company's limestone quarry drilled into an unused hole. One man was killed and two fatally injured.

The Findlay (O.) Crushed Stone Company has given to two Eastern men the contract for quarrying the stone at their large plant at West Park. The men have contracted to furnish all stone wanted for the crusher.

Theodore Bruback, Adelbert Cazier, H. S. Kerr and others, who are interested in the Nebo Brownstone Company, are rap-

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idly developing their quarry near Nephi, Utah. A branch railroad has been built almost to the quarries, direct connection being made by a cable line to the quarry proper. About twenty-five men are already employed at the quarries and orders are rapidly coming in for the stone. Mr. Cazier is manager in charge. Mr. Bruback is president and general manager of the San Pete Valley railroad.

A new siding is being laid to the stone quarries on E. M. Hoffer's farm, east of Hummelstown, Pa., and quarry operations have begun. About fifty or sixty men are employed.

The city quarries at Rockford, Ill., are running full force, supplying material for macadam roads in the city. Hundreds of loads of crushed stone are taken out every week.

The Momence (Ill.) Stone Company is opening a new quarry, which, in full operation, will employ 100 men. The company reports a difficulty in getting enough help to carry on the work it has on hand.

A Chicago party has been looking over the Portland granite quarry with a view of purchasing. The price fixed by the owner of the land is \$4,000. Should the purchase be made, the new owner will largely increase the output.—Columbus Republican.

Milford granite quarries are more fully operated than ever before. More than 1,800 men are now at work, and, should the present drift of contracts come to the various Milford quarries, the next year more than double that number will be needed there.

The Groton correspondent of the Montpelier "Patriot" says: "The M. T. Benzie granite works took out a stone last week from the Pine Mountain quarry that for quality has never been excelled at any of the quarries in the State. Some excellent stone is also being taken out at J. R. Darling's quarry."

A Greek employed in the rock quarry at Grand Tower, Ill., had both legs crushed by a heavy rock which fell on him.

The Grafton Quarry Co., has issued an order increasing the wages of all of their workmen in their stone quarries at Grafton, Ill. The increase will average about twenty-five cents a day for every workman. The company has contracts for furnishing a

large amount of stone to the Federal Government for the construction of dikes on the Mississippi river between Alton and Grafton.

The Gay Quarry Co., has been incorporated, and the principal place of business is at San Jose, Cal. Capital stock \$50,000. Directors: W. A. Porter, Watsonville; and Chas. Wehner, Gus Lion, Jas. W. Rea, A. C. Darby, A. Greeninger and T. W. Hobson, San Jose.

A limestone quarry has been discovered at Spring Valley, Wis., by W. W. Newall. It will be worked by Finney & Hyde in connection with a smelter at that place.

N. Z. Wagener has opened a stone quarry at Sturgeon Bay, Wis., and is getting out stone for foundation and dressed stone work.

The Cumberland Iron Trap Co., will commence quarrying stone at Iron Mountain Hill, Cumberland, R. I. The stone will be used for macadamizing streets and roads. The company has erected a well-equipped plant and is capitalized at \$100,000.

The quarries of the Amberg, Wis., Granite Co., which have been idle for several years, will resume operations. Enough contracts are in sight to keep 200 men at work for a full year.

The Johnson Stone Co., of Tecumseh, Neb., has all of the orders on hand that it can fill. The quarries are at Nemaha, Neb., where about fifty men are employed. The company has lately bought a quarry of red sandstone in Colorado, which it will operate in connection with its present business. The company has recently secured the contract to furnish stone for the Nemaha County court house, which will require three hundred car loads of dimension stone.

Utilizing Tidal Power in France.

At Pont-L'Abbe, Finisterre, France, the tides are utilized during fourteen hours of the day in generating power. At flood tides, the water flows through a canal two and a half miles inland, into a pond in the rear of the power house receiving the water, which returns to the sea at ebb tide. The total fall is from $6\frac{1}{2}$ to $7\frac{1}{2}$ feet, and 80 horse power are generated by means of turbines. It has been proposed to apply this means to generate electric power for industrial application.

Marble and Granite

The newspapers report that Proctor, Vt., is having a building boom this summer. There are at present about thirty-five houses in course of construction for the Vermont Marble Company alone. The marble business is the best ever known in the town. The company is working a full force night and day and the pay rolls exceed by more than \$10,000 per month those of any previous year.

North Carolina granite is meeting with great favor and the quarries in the State are working at full blast. Many of the leading cities are buying the granite for public improvements and the general prosperity is resulting in the erection of many stone houses and churches. A fine exhibit of the native granite will be made at the Paris Exposition.

Messrs. D. J. McDonald & Co., Mobile, have recently established the only steam stone works in the State of Alabama. The firm is composed of Mr. Daniel J. McDonald and Frederick W. Kearns, who have been guided in their work by the firm belief in the general prosperity that is ahead for the stone business in the South. At the head of Water street, in Mobile, they have just erected one of the finest steam plants in the South equipped with the most improved of modern machinery. The works are connected directly with all of the railroads entering the city, thus giving the company admirable shipping facilities.

Mr. J. P. English has just established himself in the marble and granite business at Quincy, Ill., as the successor to T. E. Wisdom.

Martin H. Crumrine, of Akron, O., has brought suit against the Cleveland, Akron & Columbus Railroad for the breaking of a granite monument die shipped to him from the Quincy quarries.

The Hudson County (N. J.) Granite and Marble Dealers' Association is considering a co-operative scheme which embraces the purchase of shore front property on the Hackensack river, on which a dock will be erected. Here stone of all kinds will be

received by boat and will be worked and carved. It is proposed to have a salesroom at the eastern end of the dock.

Stampen & Barker, marble dealers of Petersburg, Ind., were burned out but have secured new quarters and will resume business at once.

The Lanesville (Mass.) Granite Company's property has been sold at auction to Charles H. Cleaves, of Rockport, for \$12,580.

Messrs. John Henigan and Robert Souden have purchased the marble and stone works at Tonawanda, N. Y., established a number of years ago by John O. Ball, and latterly operated by E. G. Riesterer.

Transgott J. Abrahams, a marble dealer of Austin, Minn., has filed a petition in bankruptcy. Liabilities are about \$30,000 and the nominal assets \$40,000.

Gotlieb Metzger, a retired marble and granite dealer of Baltimore, is dead; aged 71 years. Deceased was born in Wurtemberg, Germany, and participated in the revolution of 1848 led by Carl Schurz. He came to America in 1849.

The Inter-Mountain Marble Company, of Salt Lake City, has been incorporated with \$25,000 capital. The officers are D. D. Hanks, president; A. M. Wallace, vice-president; H. Hales, secretary; directors, Neil Olsen, J. P. Smith and J. P. Johnson. The company owns Stateline Nos. 1 to 8 inclusive, in White Pine County, Nev. Its business will be the quarrying of marble.

F. D. Moore, of Blissfield, Mich., is making improvements in his marble yard.

The New England Granite Company, of Concord, has received the contract for the granite trimmings of a large apartment hotel to be built in New York. With the work already on hand this will keep all of the men at present in the sheds employed for some time.

Frey & Co. are erecting a new building at Watseka, Ill., for their monumental business.

Roland Pond, a monumental dealer of Owosso, Mich., is making improvements at his works.

W. E. Hill, of Benton, Ill., is erecting a new building for his monumental business.

H. C. Jansen has established a monumental business at 425 West Second street, Davenport, Ia.

William Christie, Jr., and David Archie have established a monumental business at Villisca, Ia.

C. Hecker has opened a new marble works at Plymouth, Wis.

The Keystone Marble Company, of Hockersville, Pa., is so crowded with orders that it has been compelled to run its saw mill nights.

A granite cross, 21 feet long, 8 feet 8 inches wide at the arms, and 32 inches thick, has been shipped from Barre to Woodlawn.

The Peoria (Ill.) steam marble factory is considering the project of removing its plant to South Peoria, in order to obtain more room for its growing business.

Messrs. O'Brien & Sheehan, of New York, have been inspecting the granite quarries at Biddeford, Me., with a view to their purchase.

David Bigelow has bought a half interest in the Queen City Marble Works at Hastings, Neb.

The city of St. Joseph, Mo., is suing Dr. John M. Austin for the possession of granite blocks that were taken up from the front of the latter's property. The city is repaving the street and had sold the old blocks to a contractor. Dr. Austin claims that he had paid for the blocks at the time of the original paving and refuses to surrender them.

George J. Lundy, proprietor of the Soo Marble & Granite Works, at Sault Ste. Marie, Mich., is erecting a new business block in order to secure larger quarters for his business.

During July the Vermont Marble Company distributed about \$60,000 among its employees for services.

W. I. R. Howard, of Jamestown, Ark., has discovered a vast deposit of pure black marble of the finest quality underlying his farm.

Messrs. Brooker & Sworm have bought the granite and marble business of R. W. Greenizen, at Cass City, Mich.

Charles S. Moore, proprietor of the marble and granite works at Middletown, N. Y., has formed a partnership with Newton Lefever, of Ellenville.

The Alaska Marble & Onyx Company has been incorporated in the State of Washington. Capital stock \$100,000. Incorporators: N. P. Richman, J. H. Lander, Pierce Jones, George P. Cragin and J. H. Brummitt.

Mr. J. H. Ketcham, the Eastern selling agent of the United States Marble Company, of Spokane, Wash., is in New York introducing the products of the company's quarries to dealers. The quarries are located at Valley, Wash., and were described at length in the March number of *STONE*. They produce large and flawless blocks of rich green and variegated onyx, as well as several beautiful varieties of blue and white mottled marble. Both marble and onyx are found in inexhaustible quantities and in almost endless variety. The company, through Mr. Joseph A. White, vice-president has donated to the Monaghan Monument Association, of Spokane, \$1,000 worth of onyx to be used for the monument to be erected in that city in memory of Ensign Monaghan, who lost his life at Samoa.

The Portland "Oregonian" says: A fine quality of dark gray granite has been found on the Snake river, about six miles above the mouth of the Grand Ronde. It exists in Asotin county, Washington; Walla Walla county, Oregon; and Nez Perces county, Idaho, the ledge crossing the Snake where these three counties join. A sample of the stone was brought to Portland yesterday by A. B. Niles, of Walla Walla. In color and texture it is exactly like the famous Barre granite of Vermont. It takes a very high polish, and the contrast between polished and hammered surfaces is very decided. It is valuable for monumental purposes and building trimmings. A quarry has been opened which shows a solid sheet between two natural beds, forty feet long and twelve feet in thickness.

Two hundred feet of trestle on the Columbia, Newberry and Lourens road over Broad river, near Columbia, S. C., gave way the other day under a train load of granite. Several cars and an engine fell fifty feet into the water and four men were killed.

The Stevens Granite Company, of Milford, N. H., has a large number of contracts on hand for street, bridge and rail-

road work. The quarries of the company are under the supervision of S. A. Lovejoy and employ about forty-five men on an average.

The Vermont Marble Co., is putting in mammoth sand-conveying apparatus at Proctor. This will serve to carry sand from the immense deposits on Cheney Hill to their mills.

A new Boston city ordinance requires that all loads that can be divided shall be limited to six tons. The granite men of Quincy declare that this is a serious blow to the business of teaming Quincy granite to Boston. They declare there is no profit unless eight or nine tons can be drawn at a time and say that the roads cost enough to stand such a load.

The Life of Winding Ropes in Germany.

During the last three years the winding ropes in the Dortmund mine inspection district have been made exclusively of cast-steel wire, two round iron-wire ropes having been used in 1895 and two flat Manila fibre ropes in 1893. During the period of twenty-seven years from 1872 to 1898, during which a strict record has been kept of all particulars connected with winding ropes, the proportion of breakages has gradually, and with tolerable uniformity, become reduced from 19.3 to 0.53 per cent. of the whole number. Last year, out of the 369 ropes renewed at the 116 collieries, 316 were round and 53 flat. Two flat ropes broke suddenly, both of them having been made of wire drawn from mild east-steel by Bocker & Co., of Schalke, one close to the drum when beginning the lift, after it had been in use 187 days and had raised a net load of 35,510,000 tons, and the other, also on beginning the lift, 250 m. (273 yards) below the pulley, after having been in use 246 days and having raised a net load of 13,280,000 tons. Out of the total number of winding ropes (all of steel wire) used in the district last fall, 301 were ordinary round, fifty-three flat, thirteen lock-coil and two of the flat-strand description, five of the first-named having been in use more than 1,600 days, and ten of the first named with two of the last named having performed more than five hundred milliard kilogrammeters (361,657,000,000 foot-pounds). The various reasons which de-

termined the taking out of the ropes were —breakage of individual wires in 200 cases, general wear in seventy, changed conditions of winding in thirty-three, too great reduction of length in twenty-five, insufficient resistance to tensile strength as determined by testing the end cut off in twenty-one, and alteration of form in fourteen. The best results were afforded at Pit No. 3 of the Bismarck Colliery, where both the upper and the lower rope (as regards the drum) remained in use 1,386 days, each having raised 1,179,200,000 tons. These and other remarkable results recorded are attributed by W. M., in "Gluckauf," partly to the excellence of the material from which the rope is made together with careful construction, but also and especially to the well-designed arrangements for winding.

Pearl Fishing in the Dutch East Indies.

A report on the pearl fisheries in the Dutch possessions in the Eastern archipelago states that the shells of the pearl oyster form one of the most important exports from Macassar; and, up to the beginning of the present decade, they were sought almost exclusively by natives, who fished in the shallow water of the bay without using a diving apparatus. Residents in the Eastern Archipelago now give more attention to the fisheries, and Europeans, Chinese and Arabs make arrangements with native chiefs in whose waters shells are supposed to be, by which a rent or royalty is paid for the right to fish. Two hundred and fifty tons were exported from the Dutch East Indies in 1897, and the quantity is increasing.

An Old Roman Pavement in Dorset.

At Dorchester, Dorset, England, which has proved so rich in ancient Roman relics, another interesting discovery has just been made. During some excavations on a building estate on the confines of the borough, and only a few hundred yards from the ancient Roman amphitheater, a splendid specimen of a villa pavement has been disclosed. The pavement is about two feet below the surface, and the design is unusually elaborate, while the coloring of the tesserae remains almost as fresh as when laid down.

Limestone and Sandstone.

The Perry-Matthews-Buskirk Stone Co., one of the best known concerns in the Indiana limestone region, has just made a purchase that will largely increase its facilities. The company has bought the large mill and entire plant of the Salem-Bedford Stone Co., situated on the outskirts of Bedford, and including one hundred and forty acres of land. This is a fine modern plant with six large gangs of saws, planers, lathes, and headers, for heavy masonry and cut stone work of all descriptions. The company will now have one of the largest lathes in the district for turning columns of immense size. The Perry-Matthews-Buskirk Co., has retained the services of Mr. M. F. Brooks, who was for many years superintendent for the Bedford-Salem Co., and who is a thoroughly practical man in the mill and cut stone business. The capacity of the company from the quarry and mill is now over one hundred and fifty cubic feet per month and the works are running full in all departments.

E. C. Thym, of Carthage, Mo., has secured a contract for the erection of a manual training high school building at Kansas City. The building was designed by Charles A. Smith, of Kansas City, and will cost about \$250,000 and will be built of Carthage limestone. The stone will be taken from the quarries of the Carthage Stone Company and the Carthage Marble & White Lime Company.

Oolitic, Ind., is considering the erection of a town hall. The plans call for a wooden structure. It would seem as if a wiser plan would be to wait until sufficient funds were available for the erection of a building of the famous stone which gives the town its name.

Pleasant Nelson, a 16-year-old boy, was killed in an accident in the Chicago and Bloomington Quarry, near Bloomington. A large stone was being hoisted and the dogs slipped out and struck him.

The Bloomington "Progress" publishes a list of the business enterprises in that wide-

awake city. Among the things enumerated are ten stone quarries, ten stone contractors, two saw mills, eight stone cutters, three marble shops, three stone crushers and one steam roller.

The first shipment of Mansfield red sandstone for the Presbyterian church at Upper Sandusky has been delivered.

The Stone Planers' Union, No. 7640, of the American Federation of Labor, was organized about three months ago. It includes about forty men near Bedford and seventeen near Bloomington. The planer men have been getting 25 cents an hour and have worked extra time at the same rate. The Union has given notice that hereafter a new scale of wages would go into effect; ten hours to constitute a working day at 30 cents per hour and no more than two hours overtime to be required, to be paid for at the rate of 45 cents an hour. The stone companies say they will not pay the scale. The number of planers in the Bedford mills are: Bedford Quarries Company, 18; Norton Reed Company, 7; Salem-Bedford, 7; Kerber Furst, 9; Bedford Steam Stone Works, 2; Kann Mill, 1.

Twelve stonemasons working for Harry C. Sense, of Bedford, went on a strike because three of their number, who arrived in Bedford some days ago and promised work on the job were not given pay from the day they arrived as they demanded. A peaceable settlement was made and the men returned to work.

Losses in the Central Ohio Stone Company, which had quarries near Sharon, Pa., have caused Hamilton & Dailey, of Youngstown, O., to file a petition in bankruptcy.

Dwight Halderman has purchased of the Cleveland Stone Company the mill used at the Mussey quarry and has moved it to Tippecanoe, O.

The strike in the Alton (Ill.) limestone quarries, which was on for several weeks, has been settled. The strikers demanded an eight-hour day with the same pay as

for ten hours. It has been acceded to. Eight quarries were affected.

The Lemont (Ill.) Limestone Company has added fifteen men to their force, which now numbers about fifty employees. Several boatloads of stone are shipped daily.

A fine monument of Bedford stone has been erected by the Grand Army Veterans in the Winnebago (Ill.) cemetery.

A hot fight is on between the Leesville Stone Company and the Broken Sword Stone Company, as to stone paving in Bucyrus, O., one company furnishing limestone and the other sandstone.

The Broken Sword Stone Company is pushing the work at its quarries near Bucyrus. A railroad spur has been constructed. The stone has been stripped for a large area, and the heavy machinery is being placed in position.

The new Monon stone road north of Bedford has been completed. Owing to the easy grades, engines can draw nearly twice as many carloads of stone as heretofore. The new line is one-half mile longer than the original and the total cost is estimated at \$300,000.

Captain Hughes, of Morris, Ill., has discovered on his farm, in Grundy county, a quarry of sandstone sixty feet in depth. The stone is soft when taken out, can readily be cut, and hardens on exposure.

Barber, Engle & Co., of North Amherst, O., have been prospecting on the Van Alsdall farm, near Dimondale, where, a few years ago, quantities of sandstone were taken out. At that time the surface stone was found too soft and too full of iron pyrites to be used for building purposes and the quarry was abandoned. The quarry has now been tested to a depth of eighty feet and the stone is found to improve below the surface. Options have been secured on the property and it is not improbable that the quarry may be developed.

All of the Indiana monuments on the Chickamauga field, which were dedicated on September 19, are built of Indiana oolitic limestone and are among the most beautiful on the field.

Work has been begun at Berea, O., on the new plant of the Cleveland Stone Company, to take the place of the factory burned some weeks ago. This will be the largest grindstone factory in the world. There are two large buildings in construction, as well as several smaller ones. The

largest of the buildings is to be over 400 feet long and in this the grindstones will be turned out of the rough blocks of stone as they come from the quarry. There will be a depressed railroad track so that the grindstones can be rolled from the lathes where they are made directly onto the cars, without lifting them at all. It is expected that the building will be completed in a short time.

The Chicago "Tribune" says: "Bedford, Ind., known as the Stone City, has the most extensive oolitic building stone quarries and mills in the world. The oolite formation is of great depth at Bedford, and has the character of marble, with various tints of buff and blue color. The stone exists in strata four to eight feet thick, one beneath another, and in some of the best quarries six or seven of these ledges, as they are called, furnish marketable stone, which is cut into long monoliths by steam chiseling machines, called channelers, right from the ledge, and afterward broken into blocks. Much of the stone is shipped in the rough from the twenty-five quarries in the Bedford district; but there are fourteen steam mills which make a business of sawing the blocks into slabs, planing them into molded cornices and lintels, and turning the longer ones into immense round columns. An average of sixty carloads of stone is shipped daily from Bedford during the greater part of the year. The Chicago Library Building is built of Bedford stone, as also is the Auditorium to a large extent and many of the Chicago churches. Bedford is incorporated as a city, with 7,500 population, and the corporate seal represents a derrick hoisting a stone on a flat-car."

The Connecticut Steam Brownstone Company, of Portland, is obliged to run their stone sawing plant until 9 p. m. every night. The company has so many orders on hand that the indications are that the extra mill will have to be continued well into the fall.

The Woods standstone quarries at Marble Falls, Tex., now employ twenty-five men quarrying and dressing stone for Houston.

The shipments of stone over the Monon from the Bedford quarries are said to be the heaviest in years and, with its new track open, it hauls in either direction, with its big locomotives, fifteen to twenty more

cars. A large percentage of the shipments at present go to points in Pennsylvania and New York, and quite a sprinkling to Boston, while the Northw^e.t shipments are again becoming heavy.—Indianapolis Journal.

City Engineer Faith, of Washington, Ind., pays the following tribute to Bedford, according to the "Herald," of the former place: "Bedford is the boom town of Southern Indiana. Everything appears to be working over time, and you can't find a vacant house in the town, although the carpenters and builders are doing their best to supply the demand. I saw several families living in barns and a few in tents. The S. I. railway is pouring thousands of dollars into the city every week, and the stone quarries are working steadily. Evidently the town has a great future."

The Southern Indiana Hotel Company have completed arrangements for the building of one of the finest hotels in Indiana, at Indian Spring. Architect J. A. Hawkins, of Wilkesbarre, Pa., has submitted plans for the building, which is to be entirely of Bedford stone. It will be 200 feet in length, 60 feet wide, and will contain 200 sleeping rooms, besides kitchen, dining room, parlors, laundry, reading rooms and barber shops. It will cost \$225,000. It will be ready to open to the public in about one year.

The Bad Axe (Mich.) "Tribune" says: "It is not generally known but it is a fact Bingham has stone quarries that are destined to be of great commercial value in the near future. Huron County stone industry has already a world-wide reputation. Great quantities of scythe stones are shipped from Grindstone to Russia and all over Europe. From the same quarries the handsome residence of Governor Pingree, on Woodward avenue, Detroit, was built. Bay Port has sent its building stone to Saginaw and many inland cities, and now Bingham is coming to the front with another fine quarry."

The Building Trades in England.

The Library Committee of the Liverpool Corporation have recently issued a report which well exemplifies the condition of the building trade in England. From it there would seem to be an abundance of work in the country, but the workmen are not

disposed to co-operate in clearing it off. The Liverpool committee, says the "Architect," were compelled to announce that the lower portion of the new central technical institute was not likely to be completed at the time which was arranged. The explanation offered was that the builders were compelled to wait a long time for steel girders, and the delivery of a steel bridge had not yet been made. Another cause was the scarcity of stone masons. There were, at the time the report was made, only twenty-five masons working on the building, and there ought to be about eighty. The difficulty in getting the requisite number of masons arose from the extraordinary prosperity of the building trade, and the fact that masons could get plenty of work in soft stone, which they preferred to the hard stone which was to be used in the erection of the new institute. Similar delays have occurred in other towns, and they appear to show that in spite of conciliation boards, conferences, agreements, the workmen continue to be masters of the situation, and that an undercurrent of opposition to the contract system exists.

Coaling at Sea.

The navy department is said to be arranging experiments with an aerial cable line. According to the plans the vessel to be coaled and the collier with fuel need not approach each other closer than 600 feet. The two vessels are to be connected with steel cables, on which will be run a line of coal-transmitting buckets. The slack in the cables is to be taken care of by special engines constituting part of the coaling apparatus.

Neuchatel Asphalt Deposits.

The asphalt deposits of the Val de Travers, in the canton of Neuchatel, have been known for 200 years, but have been worked regularly only since the beginning of this century. The crude asphalt is a white limestone colored black or brown by bitumen. It is of Cretaceous age, the bed being 13 to 26 feet in thickness. The asphalt is obtained by quarrying, the blocks being broken into pieces which are ground to powder in mills. The rock mined contains 10 per cent. of bitumen.

Stone Trade Notes

A new stone crushing works is to be erected by Messrs. Atwood & Co., at Plattsburgh, N.Y.

Thieves broke into the magazine of the Monroe (Mich.) Stone Company and stole forty pounds of dynamite and a quantity of caps and fuses.

J. S. Bowers, of Decatur, is erecting a stone crusher at Jay City, Ill., which crushes 125 yards a day.

Since Manistique, Mich., has purchased a stone crusher it has constructed roads at an average cost per rod of \$1.45 1-2.

Isaiah Lawrence has been elected president of the Granite Cutters' Union of Baltimore.

Charles Carlson, a prominent stonecutter of St. Cloud, Minn., was killed by lightning while returning from work.

Contractor Bert Davidson, of Grand Marais, Mich., having completed one contract for the Government has been tendered another which calls for all the stone he can furnish until the close of navigation.

The Neish Stone Company, of San Francisco, has been incorporated. Capital stock, \$40,000. Directors: James G. Neish, D. C. Neish, L. L. Delano and M. S. Delano, of San Francisco, and M. C. Delano, of Rockland.

Mrs. Anna Kline Rickert, of San Francisco, the only woman president of a railroad in the United States, has been sent to jail for five days for contempt of court. Mrs. Kline is interested in many mining properties and owns a cement mine and two stone quarries. Her jail sentence is due to her refusal to bring into court the books of the Stockland & Tulomne Railroad Company, of which she has been president for some time.

William D. Lewis, of Madison, Wis., will erect a complete stone cutting plant in Beloit.

The Stonecutters' Union, of Winfield, Kan., have secured a new schedule for nine

hours work at the same pay as ten hours heretofore.

Messrs. McNamee & Coutant will erect a new and large stone crushing plant on the Fly Mountain road, near Eddyville, N. Y.

Rich deposits of moulders' sand have been discovered near Chillicothe.

The Findlay (O.) Crushed Stone Company has engaged fifty new men, most of whom will work at night. The company has so many orders that it is obliged to keep its plant running at night.

Wausau, Wis., has purchased a stone crusher and begun operations.

Edward Barns, a well-known stonecutter of Anderson, Ind., is dead, aged 50 years.

James Duncan, general secretary to the National Granite Cutters' Union, has removed his headquarters and the office of the "Granite Cutters' Journal" from Baltimore to Boston. The new location is in the New England Building, 46-48 Summers street. A new executive committee has been elected by the Boston granite cutters.

The Momence (Ill.) Stone Company has secured the contract to furnish crushed stone to Crete at 95 cents a yard.

Multnomah county, Ore., has purchased a portable stone crusher, which is now crushing stone for the town of Gresham.

The extensive stone crushing plant of John T. Dyer, at Howellsburg, Chester county, Pa., has been destroyed by fire. Mr. Dyer states that his loss will exceed \$45,000, with only \$5,000 insurance. Seven hundred pounds of dynamite were safely removed from the powder house. Mr. Dyer has not yet decided whether he will rebuild. Nearly 200 men were thrown out of employment.

It is reported that the Ohio Sand Company will erect a \$10,000 plant at North Springfield for the purpose of removing the stone from the moulding sand which is being shipped from that point.

Rockland township, Pa., recently pur-

chased a stone crusher for \$850. The taxpayers now declare that the commissioners did not have authority to purchase and demand that the crusher be returned to the maker.

The Biesanz Stone Company, of Winona, Minn., reports rushing business. They have received a number of contracts for cut stone and curbing.

Henry Ives Cobb, the architect of the Chicago post office, says that there is no doubt that the cornerstone for the new building was cut at Hallowell, Me., by union labor. Therefore, there is not likely to be any trouble when the cornerstone is laid by President McKinley.

Good roads conventions are being held all over the State of Illinois.

Owing to the rush in the granite business in Vermont there is a scarcity of stone cutters in that section, and a number of firms have advertised for men.

The Waverly Stone Co., of Holland, Mich., has a contract for furnishing two hundred and fifty cords of stone for a new paper mill at Muskegon.

Joseph Dux, of Chicago, has been awarded the contract for stone carving on the State library building, at Madison, Wis., his bid being \$11,495.

L. L. Lindauer, of Kaukauna, Mich., has a large number of contracts for rubble and dimension stone, including one large order for a new paper mill at Wausau.

The Stone Lamb.

A German clergyman, Pastor O'Feuke, tells a story in a very interesting book of his about things which have really happened to him, or which he has met with in his travels. One day he stood before the beautiful Roman Catholic Chapel of Werden an der Ruhr, in Germany, waiting for the key to be brought that the door might be unlocked for him and his friends to enter. While they waited they saw something on the ledge of the roof which they found to be a carved stone lamb, and began to wonder what it meant up there. So they asked an old woman who was hobbling along a little way off if she could tell them about it, and she replied "Yes"; and then related why it had been placed in that strange place.

"Many, many years ago," she said, "where that lamb now stands, a man was busy repairing the roof of the chapel, who

had to sit in a basket fastened by a rope as he worked. Well, he was working in this manner one day, when suddenly the rope which held the basket gave way, and he fell down, down from the great height to the ground below! Of course, everyone who saw the dreadful accident expected that the man would be killed, especially as the ground just there was covered with sharp stones and rocks which the workmen were using for building. But to their great astonishment he rose from the ground and stood up quite uninjured. And this was how it happened; a poor lamb had wandered quite up to the side of the chapel, in search of the sweet young grass which sprung up among the stones, and the man had fallen on the soft body of the lamb—it had saved his life, for he had escaped with the mere fright, and with not so much as a finger broken. But the poor lamb was killed by his heavy fall upon it. So, out of pure gratitude, the man had the stone lamb carved and set up as a lasting memento of his escape from so fearful a death, and of what he owed to the poor lamb."

Sea Embankment for the Hodbarrow Iron Mines.

Particulars have just been published of a gigantic engineering scheme at Hodbarrow iron mines, in the south of Cumberland, England, in the form of a great sea embankment intended to keep the sea out of the workings of a very valuable mine. Some ten years ago a very large sum of money, approximating nearly \$1,000,000, was spent in the building of a sea wall at the same place. It is now proposed to go further seaward with a more ambitious scheme. The new wall will be in the form of an embankment, with a puddled trench, and with rough squares of concrete tumbled higgledy piggledy as a means of breaking the force of the wash from the sea. The new embankment will be 6,750 yards long and will inclose 170 acres of land, under which the new extension of the mine will be worked. Ore has been proved to exist in vast deposits under this area, and although the cost of the proposed scheme will probably be from \$2,000,000 to \$9,500,000, it is well worth the enterprise, as Hodbarrow ore is not only the best hematite in England, but is of the most uniform quality.

The Slate Trade

The Slatington-Bangor Slate Syndicate has made a shipment of a carload of slate blackboards to the Pacific coast containing 7,000 square feet, said to be the largest carload ever shipped from Slatington.

Oscar Smith, employed at Hersh's quarry, formerly the Empire, near Slatington, was thrown into the quarry, a depth of eighty feet, by a swinging stone. He was seriously injured.

A contract has been awarded the S. Flory Manufacturing Company for a new double drum hoisting engine and gin for Jackson Bros.' quarry, at Pen Argyl, to be completed by December 1. This quarry is expected to produce from 2,500 to 3,000 squares a month next year. The Flory Company will also furnish a new hoisting engine for the Pen Argyl Valley quarry, operated by William Harding, Sr.

C. H. Broodbank, senior member of the firm of C. H. Broodbank & Co., London, England, is on a visit to the Pennsylvania slate quarries. Mr. Broodbank is a large purchaser of American roofing slate.

New top is being uncovered at the Pen Argyl Valley quarry. When it is completed the quarry will be one of the largest in that section, and will produce from 2,500 to 3,000 squares of slate per month.

A large piece of top is being taken off at the Albion quarry, at Pen Argyl, and when this is completed, and all the rubbish is taken out of the bottom this quarry will produce about 7,500 squares of slate a month. A prominent slate man estimated a few days ago that in another year from 22,000 to 25,000 squares of slate could be made at the quarries on the Blair and other properties between the Pen Argyl Valley and Parson Bros.' quarries all within the borough limits of Pen Argyl. This would mean an annual production of from 200,000 to 250,000 squares.

The old Delabole Slate Company, near Pen Argyl, has begun making slate with one block.

The sheriff of Northampton county, Pa., has sold the following named properties: The property of the Danielsville Slate Company, in Lehigh township, with notice to Samuel May, terre tenant, to Samuel Flory, for \$42,100; the slate quarry and land of the Bangor-Superior Slate Company, in Plainfield and Washington townships, to George W. Mackey and David Stoddard, for \$200.

A second large slide has occurred at the National Slate Company, at Danielsville, Pa.

The Klondyke Slate Company, of Pen Argyl, is uncovering a strip 45x65 feet.

A charter has been granted by the State Department to the Bangor Star Slate Company, of Bangor; capital, \$2,000.

A derrick standing on the brink of the Locke slate quarry, at Slatedale, broke recently. The big traveling rope fell on the engine house, cutting it in two and causing a cave-in. William Lloyd, a bell boy, 14 years of age, fell 100 feet into the pit. He was instantly killed, his neck and legs having been broken and the body horribly mangled.

The Harford Peach Bottom Slate Company is having a tower erected for the support of a cable to be used with their increased hoisting facilities.

The old York & Peach Bottom quarry is a lake of water of a depth of about 140 feet, which would become much deeper were not the pumps kept running to prevent the flooding of the present workings.

Two heavy falls of side have occurred at the Proctor quarry, at Delta, Pa., within a short time, and the reopening of large cracks in the ground twenty to thirty feet back from the quarry side indicate another heavy fall, and the endangering of the cable tower and part of the buildings. Work has been suspended for the present.

The entire force of Proctor Bros. has for the present been transferred to their

York & Peach Bottom quarry, where immense amounts of excellent rock is being converted into roofing slate.

New quarries are being developed on the Henry property, near Cardiff, Pa., by John W. Jones and others; on the Capt. Jones property, by W. Jerry Jones, and a short distance east of R. L. Jones' quarry, near Slate Hill, by Hughes Bros.

J. Fred Bachman, of Danielsville, has bought the slate quarry near that place, formerly operated by Mrs. Henry Biechy.

Fair Haven Correspondence.

Fair Haven, Vt., Sept. 12.

The American Slate & Marble Company, Edward Allen president, has just shipped a fine marble altar and a large force has started on an extensive altar job in fine marbles and brasses. This firm, though a new one, can and has produced as fine a job as any in the country.

The marbleized slate for electrical purposes has quite a boom in this village. Firms engaged in that class of work are way behind in their orders. Vermont slate is peculiarly adapted for electrical work, being close grained and easy to bore.

The roofing slate business still is rushing, every square of slate being sold almost before being split.

A representative of the largest billiard table manufacturing company in the world was here during the week to place orders. However much champagne the crack wizards of the cue may drink around and about our billiard slate in the cities, we can't make enough out of billiard slabs to do it here. Our turn is coming, like railroad stock.

Messrs. Minogue Bros. & Quinn, proprietors of the Trojan Slate Quarries, have ordered a new boiler of greater power, the present one being inadequate for their increasing business. The Trojan quarries produce some of the largest and best quality of slabs to be found in the country.

Bolger Bros. have, after considerable expense and time, got their new quarry into working shape. The stock is equal to any. They have increased their force at the mill.

William Bolger, James O'Brien and others have erected a derrick and are about to open a new quarry for the production of roofing slate. Experts say the outcrop-

ping would indicate roofing slate of a superior quality.

Mr. Hilt, one of the gentlemen interested in the Vermont Slate Syndicate, was at the local office during the past week. His head office is in London, England.

Our billiard slate stock is going to rise.

C. H. Broodbank, of London, England, called at the office of the New England Marbleized Slate Mantel Company. Mr. Broodbank is the above company's agent for Great Britain and her colonies.

The New England Marbleized Slate Mantel Company have just shipped two large wainscot orders in marbleized slate, to New York. This firm makes a specialty of that class of work.

Electric Blasting in Slate Quarries.

The system of simultaneous blasting by electricity has lately been adopted at Llarn-gwern quarry, Corris, with results which far exceeded the sanguine expectations of the directors and of the men, says "The Quarry and Builders' Merchant," of London. The first blasts were under the superintendence of Kellow & Co., Portmadoe, who supply the electric blasting appliances, and, when necessary, give instructions in their use. On August 8, 15 holes, varying from 4 to 8 feet deep, were fired simultaneously, bringing down about 2,000 tons of waste rock in one operation, and on August 17, three blast of 8 holes, 9 holes, and 19 holes respectively were fired with equally good results. The latter especially was a grand testimonial to the excellence and efficiency of the apparatus supplied. A small instrument is also used by which each hole can be tested before firing, and thereby render absolutely impossible those "missfires" which under the old system are such a frequent cause of accident. A long cable is also used which enables the person firing the shots to be 120 yards from the scene of the explosion. From the point of safety, this is an immense advantage over the old style, when the man had to set fire to the fuse and then take his chances of being able to get far enough away before the holes went off. The blasts were a grand sight. All the holes going off together at one moment, and the huge mass of rock crashing down the next moment like a peal of thunder following a flash of lightning.



Monumental News



A bronze statue to Rear Admiral Raphael Semmes, of the Confederate navy, which will be erected in the city of Mobile, was recently cast in Newark. It was the work of the late Caspar Buberl, who died while at work on the Dewey arch.

Contractor W. H. Morse has begun work on the soldiers' monument at Kenosha, Wis., presented to that city by the ex-mayor, Z. G. Simmons. The monument was designed by D. H. Burnham, of Chicago. The main shaft is over fifty feet in height and will be one of the largest pieces of granite ever taken from an American quarry. It is hoped to have the monument ready for dedication by November.

Lewis Haldy & Son are erecting a granite shaft at Lancaster, Pa., over the grave of Col. David Miles, of the Seventy-ninth Pennsylvania volunteers.

The committee in charge of the new county building at Detroit is discussing the problem of whether to have bronze or stone statues in the tower.

Homer, Ill., is raising funds for a soldiers' monument.

Fisher, Ill., has already raised \$5,000 for a soldiers' monument.

John B. Leoni, a prominent Italian sculptor, has been sent to the Illinois asylum for the insane. His insanity is due to a fall from a building. Leoni made heroic statues of importance for the Chicago World's Fair.

Salt Lake City has on hand a surplus from the sum raised for the reception to the volunteers returning from the Philippines. It is proposed to use this money as the nucleus for a fund for the erection of a memorial arch for the north entrance of Lincoln Park in that city. On one side of the arch would be inscribed the names of the living members of Batteries A and B and on the other side the names of those who fell with a list of the general engagements.

Columbus, Neb., will erect a \$3,235 sol-

diers' monument of Barre granite. The monument will be an obelisk in design, will stand twenty-nine feet high and will be erected in the public square.

Coldwater, Mich., is discussing a soldiers' monument, and the suggestion is made that it be an elaborate affair costing fully \$25,000, and be erected of the native stone of the State.

The bronze badger for the battleship Wisconsin, which will be presented by that State, has been cast at the American Bronze foundry in Chicago. Paul Kupper was the sculptor.

The village of Penn Yan, N. Y., recently had a unique commemoration. This was the unveiling of a monument to the memory of David Wagener, who was buried in the village cemetery August 24, 1799. The monument was erected by the granddaughter of Wagener, just 100 years from the date of his burial. His was the first body interred in the village cemetery.

Four Spanish cannon captured at Manila will adorn the monument to be erected to the dead Oregon volunteers at Portland.

A newspaper report, which bears the earmarks of a theatrical agent's imagination, says that a movement is on foot to erect a colossal statue of Frederick the Great in Central Park, New York.

M. Falguiere, the French sculptor, has just completed his statue of Balzac. This represents the writer in an attitude of perfect calm and reflection, and is as far removed as possible from the grotesque and formless statue by Rodin, which was rejected after a veritable whirlwind of criticism.

The John Brown Monument Association has already raised \$5,000 of the \$10,000 needed for the statue to the hero of Harper's Ferry.

A monument to Sergeant Charles Floyd, a member of the famous Lewis and Clark expedition up the Missouri, in 1803, is to

be erected at Sioux City, where he died on August 20, 1804. Congress has appropriated \$5,000 for the memorial.

Notwithstanding the sad fate of Lorado Taft's much talked-of water nymphs at Chicago the Art Institute of that city announces that another memorial will be made by the sculpture class next year.

The Daughters of the Confederacy are endeavoring to raise \$10,000 for a monument in the Springfield (Mo.) cemetery, where are buried 507 Confederate soldiers who fell at the battle of Wilson Creek.

The bids for the Cascade groups of the Indianapolis monument were as follows: Beil & Mauch, Chicago, \$16,000; Rudolph Schwartz, Indianapolis, \$17,000; Herman N. Matzen, New York, \$17,000; Franz Engelsman, Chicago, \$18,000. Each of the bids was accompanied by a model. The bids were to be opened on September 20.

The immense shaft which is to be the main feature of the Rockefeller monument in Lake View cemetery, at Cleveland, O., has been placed in position.

A colossal statue of the Virgin, designed by Queen Margaret of Italy, has been placed on Mount Rocca Melone, one of the highest peaks in the Alps, to commemorate the rescue of a company of Italian soldiers which was buried by an avalanche.

A marble shaft will be erected over the grave of Jim Baker, the famous Indian fighter, scout and pioneer on Snake river, Wyoming.

Congressman Mann, of Illinois, will introduce a bill at the next session of Congress providing an appropriation of \$3,850 for the improvement of the Government burying lot in Oakwoods cemetery, Chicago, known as Confederate Mound, and a further appropriation of \$250 annually for the protection and maintenance of the lot. There are buried in the Mound the remains of 4,039 Confederate prisoners of war. If the appropriation is passed it will be the first money paid by Congress for the care of the graves of Confederates.

A colossal statue fifty feet in height of Ferdinand de Lesseps has been erected near the point where the Suez canal enters the Mediterranean Sea. It is the work of M. Freinich, the eminent French sculptor.

Messrs. Triebel & Sons have about completed the large and imposing soldiers' monument at Peoria, Ill.

A newspaper report says that tombstones

of composition material are to be made under a new patent, in which the inner filling is to be made of cement and sand with a middle casing of cement and an outer envelope of plaster of paris and mucilage.

Ogden, Utah, has just started raising a fund for a monument in Lester Park to the volunteers of the State.

The Richter Monument Company, of Springfield, Ill., has been awarded a contract for massive iron gates with stone columns at the entrance to the new Carlinville cemetery.

T. W. Davis, of Peoria, Ill., has erected a monument over the spot where he expects to be buried, in Springdale cemetery, and has had cut upon it the picture of a bicycle. Mr. Davis is 72 years old and has ridden 60,000 miles on his wheel since his 61st birthday.

Kimball Bros., of Lincoln, Neb., have been awarded the contract to build the soldiers' monument at Columbus, Neb., at \$2,225.

Two young women in the sculpture class of the Chicago Art Institute have been commissioned to make groups for the Waukegan soldiers' monument.

The University of California will erect on the campus a monument to the collegians who died at the front in the late war.

A proposition is made to erect a notable monument in Schenley Park, Pittsburgh, in memory of the late Col. A. L. Hawkins. William Brady Young, a Pittsburgh architect, has submitted plans for a stone column 150 feet high to be surmounted by a bronze figure of Col. Hawkins. The column is patterned after the Column of Trajan at Rome.

Richmond's proposed monument in honor of Jefferson Davis shows a structure on the same general lines as the Grant tomb in New York, but is more elaborate in its ornamentation. The memorial is only in embryo as yet.

The Germans of Chicago have \$10,000 on hand for a Goethe monument in that city. It is said that the foundation for the monument will be laid March 22, 1900.

Messrs. Bayha & Bohn, of Denver, have erected a massive monument of Colorado granite at Dome Rock, in that State, in memory of Engineer William G. Westall, who died at his post in saving a trainload of excursionists from accident.

The monument erected by the Smith Marble & Granite Company, of Upper Sandusky, O., on the battlefield of Winchester, Va., for the 123d regiment, Ohio volunteers, has been dedicated.

A soldiers' monument has been erected by Hoagland Post, G. A. R., at Catawissa, Pa., and will be dedicated October 7.

The Rock County (Wis.) Soldiers' and Sailors' Association is considering the advisability of erecting a monument in Court Square, Janesville.

G. Turina, a prominent sculptor, died suddenly while at work on the Dewey arch, in New York.

W. G. Potter & Sons, of Geneva, N. Y., are erecting one of the largest monuments in Central New York over the grave of Horace W. Soper, at Verona. The monument is of gray Barre granite, thirty-three feet in height, with a lower base twelve feet square.

The designs submitted for a monument to Bishop Watterson to be erected at Columbus, O., were considered inappropriate and new designs were called for.

Joseph M. Huston has prepared plans for a Gettysburg memorial, which he suggests should be erected on the meadow over which Pickett and his men made their gallant charge. It consists of a main tower, 350 feet high, on the top of which will be placed a gigantic statue of Victory; on either side of the tower will be two circular buildings joined to it by graceful and beautiful peristyles. Both buildings will be of the same size. One is intended for use as an auditorium, in which, as each anniversary of the battle rolls around, the survivors of the great conflict can hold the reunions. The proposal to erect the memorial will be submitted to the G. A. R. during the encampment. It is estimated that \$250,000 will be required.

A soldiers' monument will be erected in the park at Hiawatha, Kan. A gun 14 feet long, weighing 8,500 pounds, will be mounted upon it.

George Dumars has opened a monumental works at Chippewa Falls, Wis.

Ancient Speaking Statues.

M. Gaston Maspero, the well-known French Egyptologist, has recently written an interesting article on the "speaking statues" of ancient Egypt. He says that the

statues of some of the gods were made of jointed parts and were supposed to communicate with the faithful by speech, signs and other movements. They were made of wood, painted or gilded. Their hands could be raised and lowered and their heads moved, but it is not known whether their feet could be put in motion. When one of the faithful asked for advice, their god answered either by signs or words. Occasionally long speeches were made, and at other times the answer was simply an inclination of the head. Every temple had priests whose special duty it was to assist the statues to make these communications. The priests did not make any mystery of their part in the proceedings. It was believed that the priests were intermediary between the gods and mortals, and the priests themselves had a very exalted idea of their calling. They firmly believed that the souls of divinities inhabited the statues, and they always approached them with religious fear and reverence. These priests would stand behind the statues and move their heads or hands, or speak to them, never doubting at that moment their movements and words were inspired by the divine spirit dwelling in the statues. The statues were regarded as so very much alive that in war they shared the fate of those whose deities they were. They were taken prisoners, condemned to death, or given into slavery—in other words, placed in the temples of the conquering gods. If they were returned to their own temples they bore inscriptions testifying to their defeat and imprisonment.

The World's Nickel Deposits.

There are but two large deposits of nickel known in the world at the present time, one in Ontario and the other in the French colony of New Caledonia, lying in the South Pacific ocean, 7,000 miles from the United States. The mines in New Caledonia produce each year a quantity about equal to that produced in Canada, and are the only possible competitors of the Canadian ore, and as the latter has superseded the French product in the free markets of the world, there is no doubt that it has the preference over its rival. But there is some reason to believe that an agreement has been reached between those now in control of the two great fields by which they provide the market.

Limes and Cements

A New York syndicate has purchased four adjoining farms near Bath, Pa., at an average price of \$250 per acre and will erect a cement mill.

A German syndicate has secured options on several hundred acres of land at Friedenthal, several miles east of Nazareth, Pa., and is now prospecting for cement rock with a view to decide upon a location for an extensive plant. A large plant is being erected at Martin's Creek.

The Norris & Christian Lime and Stone Company, of Marion, O., was compelled to shut down its plant the other day because it could not get enough cars to carry its output.

At a meeting of the lime manufacturers of Ohio, Michigan and Indiana, held at Toledo, recently, it was decided to advance the price of lime in barrels. Bulk lime will remain the same in price.

Members of the White Lime Association, which controls the output of white lime and cement in the States of Missouri, Kansas, Nebraska, Texas and Oklahoma and Indian Territories, have withdrawn all quotations. It is believed that a combination will be formed and that prices will be advanced.

The recently organized Legarde Lime & Stone Company, of Anniston, Ala., is erecting large kilns and a stone crusher of enormous proportions on its property seven miles east of Gadsden, on the Louisville & Nashville road. The main plant will be located there and will be the largest in the South. The Anniston office will be managed by P. Beston Brown.

Mr. E. S. Wheeler, associated with Indianapolis and Fort Wayne capitalists, has completed two large kilns at Huntington, Ind., and has another under way. These will be run in opposition to the Western Lime Trust.

A large force of men have been put at work quarrying gypsum at Port Clinton, Ohio.

The lime kilns at Sugar Ridge, O., are

running at full capacity, but report a scarcity of help.

Frank C. Trowbridge has, with the aid of the sheriff, taken possession of the works of the Adamantine Plaster Company, at Detroit.

W. J. Bennett & Co., of Huntsville, Ala., will erect a 100-barrel lime kiln.

The Fort Dodge Plaster Company, which has sixty acres of gypsum land at Carbon Junction, Ia., has erected a thoroughly equipped mill with the best modern machinery.

A ninety-foot ledge of rock, running over 75 per cent. lime, has been discovered near Spring Valley, Wis., and will be developed. An effort will also be made to develop the large beds of kaolin and fire clay at the same place.

The village of Buffalo, Minn., encourages the laying of cement sidewalks by giving a rebate of 25 cents for each square yard of cement walk laid. This encouragement has caused the construction of over a mile of cement walks this season. A local contractor does the work at 75 cents per square yard, leaving the price to the owner of 50 cents. The citizens of surrounding towns are asking for a similar concession.

The Granite Wall Plaster Co., of Youngstown, Ohio, has increased its capital stock from \$15,000 to \$120,000.

Emil Stroh is pushing the building of a large Portland cement factory at Helena, Mich.

Artificial Paving Stones in Germany

Under date of July 29, 1899, Consul Monaghan, of Chemnitz, sends the following:

Artificial paving stones are being successfully produced in this Empire. The demand, in all large cities, is so great, and the expense attached to their production under former methods is so large that any improvement on the older systems, whether in saving money or in producing a bet-

ter-stone, will be welcomed by almost all countries. The newest process here is to mix coal tar with sulphur and warm thoroughly; to the resulting semiliquid mass, chlorate of lime (Chlorkalk) is added. After cooling, the mass is broken into small pieces and mixed with glass or blast-furnace glass slag—(Hofenglassschaum). This powder is then subjected to a pressure of 200 atmospheres and reduced to the form or forms wanted. The specific weight of these stones is 2.2; the resistance against crushing is 143 kilograms (315 pounds) to the square centimeter (15 1-2 square inches). The resistance to wear and tear in use is fully half as great as that of Swedish granite. Thus it commends itself through durability equal to that of many stone roads, resistance to changes of temperature, roughness of surface—giving horses a good foothold—and finally non-transmission of sound. Inasmuch as the joinings are very small, dirt is avoided and cleaning is very easy.

Good Lime.

A good lime should possess the following qualities: When delivered, it should be in hard lumps, free from slaked particles of dust. There should be no cinders nor clinkers in it, nor should there be more than 10 per cent. of other impurities in it. It should slake readily in water, forming a very fine smooth paste, without any residue. It should dissolve freely in soft water. Lime that leaves kernels of stones and traces of silica and alumina when "run off" should not be employed for plastering, but may be used in common masonry and brick work with fairly good results.

Brick Dust in Mortar.

It is said that the addition of even so small a proportion as one-tenth of as much brick dust as of sand to ordinary mortars is preventive of the disintegration so often characterizing mortars used in the masonry of public works. The use of such dust mixed with lime and sand is said to be generally and successfully practiced in the Spanish dominions, and is stated to be, in all essential points, superior to some of the best imported hydraulic cements for the construction of culverts, drains, tanks, or

cisterns, and even for roofs, whether for setting flat tiles or for making the usual flat tropical roof.

Cement for Resisting Salt Water.

Dr. Michaelis, an Austrian authority on cements, has announced that his investigations have led him to the opinion that a mixture of Portland cement, puzzolana (volcanic tufa) and granulated blast furnace slag is better than Portland cement alone where structures are to be exposed to salt water. A company is being formed for the purpose of developing the puzzolana beds in the province of Syra, Greece.

Lining a Shaft With Rammed Concrete.

At the Gottelborn Colliery, near Saarbrucken, a portion of the shaft lining has been carried out in rammed concrete, instead of masonry, as an experiment, which seems to have turned out satisfactorily, says the *Zeitschrift fur Berg-, Hütten-, und Salinenwesen*. The concrete was prepared from one part of cement, three parts of sand, and six parts of crushed diorite, mixed by hand, slightly moistened and lowered down to the sinking platform, where it was emptied into a space left between the rock walls of the shaft and a temporary lining of timbers and iron rings. Each layer of concrete, when 6 inches deep, was rammed with iron rammers until it "sweated"—i. e., water appeared on the surface. In this way an excellent lining of uniform character was produced. The iron rings, consisting of four segments, rest on the iron traverses, the four rings being bolted together by means of vertical bolts. Notwithstanding that the workmen employed had no previous experience in ramming concrete, considerable economy was effected from the outset by this method, both in respect of materials and labor, as compared with the ordinary process of lining shafts.

Liquid Air in the Simplon Tunnel.

At the end of the Simplon tunnel, Switzerland, a Linde machine for making liquid air has been placed. Liquid air is to take the place of dynamite.

Contracts and Building

Government Work.

Lawrence, Kan.—Proposals are asked for furnishing building material, including cement, lime, building stone and structural iron, at the India school here. Address H. B. Peairs, superintendent.

League Island.—The Navy Department has rejected all of the bids on the League Island Dry Dock, and will readvertise for proposals. All the bids for the dock and its approaches were over the appropriation limit of \$825,000.

New York.—Bids will be received until October 7th, at the Bureau of Yards and Docks, Navy Department, Washington, for the construction of an extension of storehouse No. 23, at the Navy yard, New York.

Norfolk, Va.—Bids will be received at the Bureau of Yards and Docks, Navy Department, Washington, until September 30th, for the construction of a building 110 by 180 feet at the Navy Yard, Norfolk, for electric plant, plumber shop and machine shop.

Osage Agency, Okla.—Bids will be received at the Office of Indian Affairs, Department of the Interior, Washington, until October 10th for the construction of a warehouse at the Kaw school here.

Phoenix, Ariz.—Proposals are asked for furnishing 333 barrels of cement for the United States Indian School at this place. Apply to S. M. McCowan, superintendent.

Portsmouth, N. H.—The contract for building the new stone dry dock at this place has been awarded by the Navy Department to John Pierce, of New York, for \$1,089,000. There were nine bidders for the work; the highest being that of Warren Burnham & Co., of Jersey City, \$1,655,840. The firm of O'Brien & Sheehan, of New York, submitted the next lowest bid but one, to Mr. Peirce, their bid being \$1,096,746. The work must be begun within sixty days after the Navy Department informs the contractor that the site is ready to be turned over to him, and it must be completed within thirty calendar months.

Before the work of the construction proper can be begun, 130,000 cubic yards of rock must be excavated, the foundation will be covered with concrete and upon this will be laid 600,000 cubic feet of cut granite. The size of the floor will be 725 feet long by 80 feet in width, making the dock large enough for the biggest steamship in the world. Mr. Peirce is said to be the largest dealer of granite in the country. He owns the great quarries at Frankford, Me., and the company of which he is president owns the quarries at Hallowell, Me., Fox Island, Me., and the Stony Creek quarries at Bradford, Me.

Seattle, Wash.—Bids will be received at the United States Engineers office here until Sept. 30, for the construction and repairing pile, brush and stone dikes in Swinomish Slough, Washington.

County and City Buildings, Hospitals, Clubs, Opera Houses, Etc.

Bay Shore, N. Y.—Carlton E. Brewster will erect a new opera house with a seating capacity of 600 or more. Cost \$15,000.

Blackwell, Ok. Ter.—Ground has been broken here for a \$30,000 opera house, to be erected by Col. A. J. Blackwell.

Braddock, Pa.—A new municipal building will be erected here. James N. Campbell of Pittsburg, architect.

Chicago, Ill.—The Illinois Southern Hospital for the Insane at Anna, Ill., will build a new cottage and storehouse. Bids for the work, including masonry and cut stone, will be received until Oct. 3d.

Knoxville, Tenn.—Bids are being received for the erection of a city hospital. Architect Baumann.

Kokomo, Ind.—Gen. Harrison Post, G. A. R., and the Kokomo Library Association propose to erect a temple to be used jointly by the two organizations.

Martinez, Cal.—The Supervisors of Contra Costa County have voted to build a new Court House at Martinez, to cost \$100,000. Plans and specifications will soon be called for.

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Distinguished from the "Royal" by erratic
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STONE.

Meadville, Pa.—Plans and specifications will soon be asked by the commissioners of Crawford County for a new store and steel jail building.

Newark, N. J.—The Newark Athletic Club will erect a new club house on West Kinney street, at a cost of \$50,000. Boring & Tilton, New York, architects.

Paris, Tex.—The Commissioners of Delta county have decided to issue \$35,000 in bonds to build a new court house.

Richmond, Ind.—Oscar Cobb, of Chicago, is preparing plans for a \$25,000 theater, to be erected on the site of the Bradley opera house.

Santa Anna, Cal.—A special election was held here and it was voted to issue \$100,000 in bonds to erect a court house.

Topeka, Kan.—The city has voted to issue \$50,000 bonds for a City Hall and Auditorium, the latter having a seating capacity of 6,000.

Urbana, Ill.—The Champaign County Board appropriated \$50,000 for the purpose of remodeling the court house. F. E. Eubeling, O. H. Swigart, G. D. Boone, special committee.

Whitewater, Wis.—A city hall will be erected here.

Business Buildings and Residences.

Atlanta, Ga.—Bruce & Morgan have drawn plans for a twelve-story office building, steel construction, three stories of stone and the rest of brick and terra-cotta, with mosaic floors and marble halls, to cost \$300,000.

Bala, Pa.—Schermerhorn & Reinhold, Philadelphia architects, have prepared plans for a large colonial stone house of Holmesburg granite to be erected at this place, by Miss Jane B. Reichmer. The contract for the erection has been let to A. L. Fretz, of Cynwyd.

Des Moines, Ia.—Plans have been prepared for a new hotel building to be erected for P. M. Hubbel, Sixth and Chestnut streets, to cost \$60,000. C. R. Dewey, 538 Good Block, architect.

Ford City, Pa.—The First National Bank is erecting a new bank building. The structure is of pressed brick and stone and will cost \$10,000.

Galveston, Tex.—The Improvement Loan and Trust Company will erect a five-story building here. George B. Stowe, architect.

Hamilton, Ont.—Dr. Hoepfner, of the Hoepfner Zinc Refining Company, has purchased a site for the branch factory to be erected here. The buildings and machinery will cost about \$200,000.

Jersey City, N. J.—The National Trust Company will erect a steel building, 77 feet front and 160 feet deep, on the site of the Taylor Hotel. Plans are now being drawn.

Johnstown, Pa.—The Cambria Steel Company will build a six-story office building here.

New Kensington, Pa.—Work has been commenced for the new National Bank of New Kensington, at Fifth avenue and Ninth street. Cost, \$20,000.

Paducah, Ky.—A plant will be erected for the Paducah Brewing Company here.

New York, N. Y.—Bruce Price has prepared plans for a fourteen story brick and stone building, to be erected at Broadway and Cedar streets, for the St. Lawrence Realty Company. The facade of the building will be granite in the basement, the first and second stories of Indiana limestone and the superstructure of brick, with blue stone copings. Estimated cost, \$700,000.

Louis Korn has prepared plans for a nine-story hotel building at Madison avenue and Ninety-second street for W. H. Ebling, Jr. The building will have a frontage of 63 feet and a depth of 100 feet and will be of fire-proof construction. Estimated cost \$350,000.

Philadelphia, Pa.—Field & Medary have prepared plans for a four-story business building for Joseph E. Cummings, at 212 N. Fourth street. It will be of brick and stone.

Sault Ste. Marie.—Tenders are solicited for the construction of a stone mill building with timber roof and floors, at Sault Ste Marie, Ont. Plans and specifications can be seen at the office of the Lake Superior Power Company, Sault Ste. Marie, Ont.

Churches.

Barton, Wis.—Anton Dohmen, of Milwaukee, has prepared plans for a brick and stone Catholic church, to be erected at Barton. Rev. A. Rossbach, pastor.

Chariton, Ia.—The building committee of St. Andrew's parish are now receiving bids for the erection of a stone church.

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Plans and specifications can be seen at the First National Bank, Chariton.

Erie, Pa.—Geren & Weeks, of Philadelphia, have prepared plans for a church to be erected here by the West Park Presbyterian church. It will be two-story, granite and marble. Cost, \$50,000.

Grand Rapids, Mich.—St. Adelbert's Polish Catholic Parish will build a new church and a residence for the sisters.

New York, N. Y.—A new Roman Catholic Church will soon be erected at the southwest corner of Morris avenue and 163d street. Father Wallace, pastor.

Ottumwa, Ia.—A new East End Presbyterian church will be erected at a cost of \$22,000.

Philadelphia, Pa.—Architects George Nathers & Son are making plans for a group of stone and granite buildings for the Church of St. John the Divine. The structures will be a church auditorium, parochial schools and a parsonage. Estimated cost, \$25,000.

Salt Lake City, Utah.—Architect C. M. Neuhausen has prepared plans for St. Mary's Cathedral, which will be erected by Bishop Scanlan. It is estimated that the structure will cost from \$125,000 to \$150,000.

Schools, Colleges and Libraries.

Albany, N. Y.—Superintendent Charles R. Skinner, of the State Board of Public Instruction, invites bids for the erection of an addition to the State Normal School at Jamaica, N. Y. Drawings and specifications may be consulted at the office of the Superintendent in the Capitol at Albany.

Ames, Ia.—Liebbe, Nourse & Rasmussen, of Des Moines, are making plans for two large buildings for the agricultural college here. One for the engineering department will cost between \$175,000 and \$200,000.

Ashland, Wis.—An appropriation of \$15,000 has been made for building a new school.

Austin, Tex.—McDonald & Gordon have prepared plans for a high school here. It will be built of stone or stone and brick.

Baden, Pa.—Clark Bros., of Allegheny, have been awarded the contract to erect the foundation of the new St. Joseph's Academy, at this place. The superstructure will not be erected till spring. Cost, \$145,000. Sidney Hackert, architect.

Bonair, Ia.—Proposals for the erection of a new school house, Howard county, will be received until October 14 at the County Superintendent's office, James Costigan, secretary; T. J. Rutherford, president.

Green Falls, Ia.—Messrs. Liebbe, Nourse & Rasmussen, of Des Moines, have prepared plans for two collegiate buildings for the State Normal School at this place to cost \$30,000 each.

Chicago, Ill.—Architect Monday has prepared plans for the twenty-room school building to cost \$80,000, at Calumet avenue and Forty-first street.

Monon, Ind.—Hennson Bros., of Noblesville, have the contract to build a \$20,000 school at Monon.

Ripon, Wis.—A Science Hall will be built in connection with the college here.

Rochester, N. Y.—An \$80,000 school building will be erected here.

Joliet, Ill.—Architect Allen has prepared plans for a new \$100,000 township high school.

Trenton, N. J.—Harry E. Finch, of Philadelphia, has been selected as supervising architect for the proposed High School at Trenton. The structure will cost about \$125,000, and drawing are expected to be ready for estimates by March 1.

Bridges and Depots.

Arnprior, Ontario.—A new Canadian Pacific Railway station, to be built of gray cut stone, will be erected here.

Beatrice, Neb.—The Union Pacific will immediately begin the construction of a new brick and stone depot here.

Cleveland, O.—The County Commissioners will receive bids for two stone abutments for a steel bridge at Nottingham, Euclid township.

Decatur, Ill.—The Illinois Central Railroad Company expects to erect a \$50,000 Union station here this fall.

Dover, N. J.—The Delaware, Lackawanna & Western Railway will build a stone depot designed by Bradford L. Gilbert at this place, if the town will build bridges to carry two streets which now cross the track at grade.

El Dorado, Kan.—Butler county will erect a thirty-six foot arch stone bridge over Walnut river and a double arch stone bridge across Rock Creek.

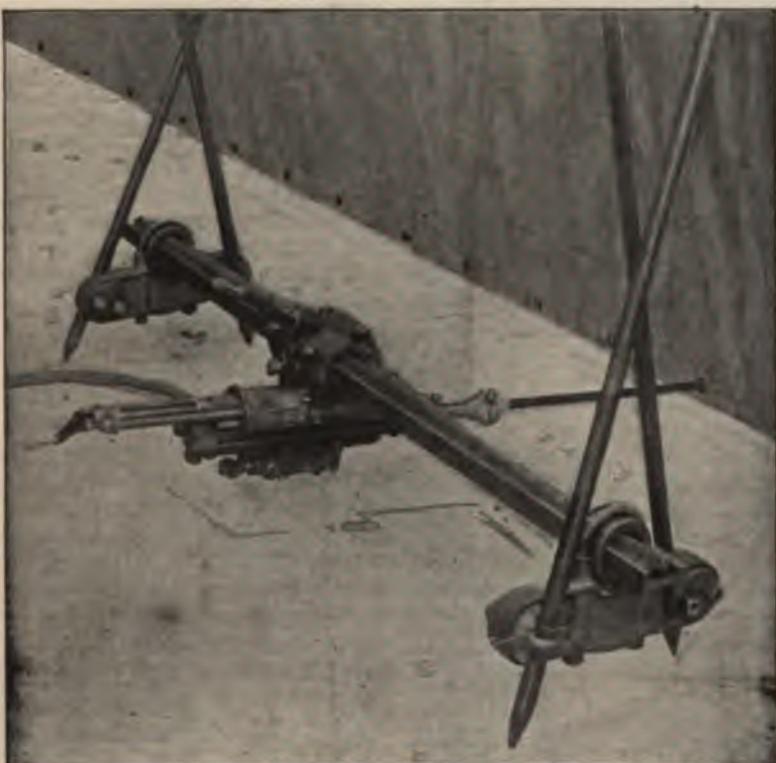
Galion, O.—The Big Four will erect a

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new passenger station with offices here, plans for which are now being prepared.

Indianapolis, Ind.—The contract for a stone bridge over Fall Creek, at Central avenue was let to Granburg, Roney & Heywood, of this city.

Leavenworth, Kan.—A wooden bridge on stone abutments will be erected at Quincy and Newman streets.

Mankato, Minn.—The County Board rejected all bids for the new stone wings for pier and fill in Decoria. It was decided to reduce the plans and receive new bids at the November meeting.

Newburyport, Mass.—The Boston & Main Railway will abolish all grade crossings between this city and Portsmouth, N. H. The cost of the improvements will be about \$100,000.

Oroville, Cal.—The following bids were received for a stone pier bridge over the Feather river here. T. W. Reese, complete stone and iron bridge, \$70,000; Cotton Bros., stone pier, \$4,200; California Bridge & Construction Company, stone pier, \$8,969.

Pittsburg, Pa.—The Allegheny Valley Railroad will erect brick and stone stations at Dubois City and Ford City, Pa. Frank H. Ashmead, of Pittsburg, architect. The buildings will cost about \$10,000 each.

St. Annes, Quebec.—The Grand Trunk Railway will build a new station at this place and Vaudreuil, to cost between \$14,000 and \$15,000. They will be built of limestone and pressed brick.

South Bend, Ind.—The Vandalia Line will build a \$60,000 station at this place.

Trenton, Mo.—P. S. Vannatta, bridge commissioner, will receive bids until October 2, for the construction of two stone abutments under the bridge on the road between Trenton and Edinburg.

Vinton, Ia.—The Burlington Cedar Rapids and Northern are building a depot at this place, of dressed stone and brick with floors of marble tile.

Waterbury, Conn.—The contract for building the abutments and central pier for the new iron bridge over the Naugatuck river has been awarded to James Geary, of New Haven, Conn.

General Stone Work.

Bucyrus, O.—A reservoir of sixty mil-

lion gallons capacity will be constructed here.

Cleveland, O.—The Forest City Stone Company has been awarded a contract for stone flagging in this city at \$1,373.93.

Crafton, Pa.—\$10,500 street improvement bonds have been sold. Bids will be advertised for paving.

Denver, Col.—Champa street will be paved at a cost of \$8,354.

Kansas City, Mo.—A \$4,000 stone retaining wall will be built along the reservoir.

Niagara Falls, N. Y.—The Niagara Falls Power Company has called for bids for the construction of a new wheel pit. This pit will be over 400 feet long, about 25 feet wide and 180 feet deep. It will be cut out of solid limestone and will be located on the inlet canal opposite the present powerhouse. The present wheel pit was cut with Sullivan channelers.

Salt Lake City, Utah.—San Juan county will expend \$2,500 on the improvement of roads and bridges.

Brick and Clay Plants.

Fairmont, W. Va.—Hammond Fire Brick Company, incorporated with \$1,000,000 capital. James Hammond, B. F. Reece and others, all of Bolivar, Pa.

Marshfield, Wis.—E. L. Reese has purchased the brick plant owned by John Hyland. Several thousand dollars will be spent in purchasing improved machinery.

Ogden, Utah.—Ogden Pressed Brick & Tile Company, incorporated with \$25,000 capital stock. Thos. D. Dee, president; E. W. Matson, secretary.

Summitville, Ind.—The Madison Pressed Brick Company, incorporated with \$15,000 capital stock. Thomas E. Strange, A. D. Smith and A. M. Werden, incorporators.

Toronto, O.—The Toronto Fire Clay Company will erect an extensive addition to their plant, which will cost \$40,000, and will have a capacity of 50,000 brick per day. J. H. McGrady, president; Edward Nicholson, secretary.

Total Coke Production of the States in 1898.

Establishments, ovens built, 48,477; ovens building, 1,048; coke produced, 16,047,209 tons; total value, \$25,586,699; average yield of coal in coke, 63.6 per cent.

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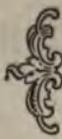
Rock Drill used to bore holes in granite columns, State Capitol, Albany, New York.



L. L. Manning & Son, Plainfield, N. J., use a Class "E" Air Compressor tacked up on the wall for driving pneumatic tools for lettering on marble and granite. It is a convenient machine for this and similar work.

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Trade Notes



We have received Catalogue No. 33 from the M. C. Bullock Manufacturing Company, of Chicago. This is devoted to the Diamond Drill, and is an admirable trade publication of higher class than most catalogues. It opens with a portrait and sketch of the late Milan C. Bullock, the founder of the company. Mr. Bullock was the father of the Diamond drill and bored the first deep hole ever bored with this apparatus. This was in 1870, at Pottsville, Pa. The hole was bored 750 feet 10 inches deep and none before had ever been drilled 300 feet. He afterwards used the Diamond drill for the United States Government, under Gen. Newton, in drilling for blowing up the famous "Hell Gate" in New-York harbor. From that time he directed his attention to the designing and manufacturing of Diamond drills that would bore to any required depth and furnished accurate information of the strata penetrated even where it was impossible to get a core. His drills have gone to nearly every civilized country on the globe. Mr. Bullock was also the pioneer in the electric light installation in Chicago and the Northwest. The Bullock drill, in all its different forms, is thoroughly described in the catalogue, from the Crescent, the smallest size made, up to the Giant, which is guaranteed to bore to a depth of one mile. The catalogue also contains general instructions for operating Diamond drills; instructions for setting Diamond bits, general information for buyers, etc. It is one of the most complete publications on the subject that we have ever seen.

The Prince Manufacturing Company, of 71 Maiden Lane, New York, has issued a pamphlet of 32 pages entitled "The Rusting of Iron and Steel; How it May Be Prevented and How It is Promoted." This is a description of Prince's Mineral Brown, formerly called Prince's metallic paint. This paint is made from an iron ore found in veins between strata of hydraulic cement stone. The paint ore is broken in small fragments and carefully roasted with wood.

This process expels the carbon dioxide and the iron while red hot absorbs oxygen and is changed into peroxide of iron. No further change in this can take place by exposure to air or moisture and it becomes practically insoluble in acids. The paint is intended for all kinds of iron and steel work. The Mineral Brown has been largely used by the United States Government and in railroad and steamship work.

The Joseph Dixon Crucible Company, of Jersey City, has issued a very attractive booklet entitled "Dixon's Graphite Productions." The various preparations of graphite manufactured by this firm, including the many different kinds of lubricants, are known by all who have occasion to use machinery. The high reputation the products enjoy is a deserved tribute to their excellency. Besides the many forms of lubricants, the catalogue describes the black lead crucibles which the company makes for all purposes, and the different styles of pencils and crayons. The company mines as well as imports graphite in all of its forms and it uses no graphite that it does not either mine or prepare. It can, therefore, guarantee the purity of its products. Another publication from the same house is "Brazing by Immersion." This is reprinted from the "Cycle Age," and shows the improved crucible made by the company for this important branch of bicycle making. Both booklets are illustrated and are attractive in appearance.

The Aetna Powder Company, of 188 Madison street, Chicago, Ill., has issued a most attractive catalogue of the famous "Aetna Dynamite." It has been prepared with great care, is profusely illustrated with handsome engravings and is printed with excellent taste. In addition to a description of the various products made by this company, which are known by everyone who has conducted blasting operations, there are chapters of hints and suggestions which make the pamphlet valuable to all who work with high explosives. Aetna dynamite is safer to use than common

THE WARDWELL Steam Stone Channeling AND Quarrying Machine

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powder; it burns without explosion, if not confined, and will not explode upon coming in contact with a spark or flame of fire. It can be thrown from any height and will stand any shock incident to handling or transportation. Some of the advantages of its use are safety and the fact that it explodes in any quantity almost instantaneously. In blasting rocks, fewer drill holes are required and they need not be as large or deep as when common powder is used, thus saving a large expenditure of time and labor. It can also be used in wet holes or for blasting under water. The dynamite is made in various brands and grades, some of which are suitable for use in quarries where rock is to be split but not shattered, and others where extremely hard rock is to be crushed. It is conveniently packed in cartridges. The Aetna Company also makes Aetna Gelatin, a plastic high explosive; contractor's powder, common blasting powder, and the high grades of sporting powders. The company keeps a full supply of the best blasting machines and it sells improved electric fuses which are of the best material and workmanship.

Amber in Eastern Prussia.

Amber is found all along the Prussian Baltic, but principally in the peninsula of Samland, which stretches west in the shape of a rectangle between the Trische and the Kurische Haff. All amber, no matter where found, on sea, on shore, or land, is State property. But the State cannot mine without permission of the ground lord. At the beginning of this century, digging was the only method employed for obtaining the amber. As it was done in an irregular manner, it exposed the country to sea ravages and upheavals of sand. Dredging was practiced between the years 1862 and 1890. Diving was tried at the same time, and by the one firm which for many years has enjoyed almost a monopoly in Samland, Stantien and Becker. Since 1891, mining by means of shafts is alone resorted to. The amber occurs in the so-called blue earth, a sandy clay with many grains of quartz and granite. In the dry state the earth is green, in the wet, almost black. The amber is concentrated in the lowest layers which rarely attain a thickness of more than five feet; the overlying blue earth is poor in amber. The blue earth

is washed with water, the big lumps being reduced with the help of mallets, and passed over sieves; the slime is returned to the sea. The shafts have a depth of from 30 to 60 feet, and further inland double that depth. The Palmnicken shaft, the first of its kind, was sunk in 1874; at present, the Anna shaft is the most important working. The yield there amounts to 500,000 kg., twice as many pounds. About 946 men and 84 clerks, etc., are busy in these works, 315 and 26 respectively being employed in the mines. The inferior amber is transformed into ambroid. The pieces are washed and dried, coated superficially with some chemical, and heated up to 250° Cent. in steel moulds, from which they are forced by a pressure of 400 atmospheres, through capillary channels into a receptacle where the ambroid cools. Amber colophony is made from very small pieces, which are fused in crucibles over coke fire; benzoic acid and amber oil are bye-products of this operation. The colophony yields a valuable lacquer. The firm mentioned has been bought out by the Prussian Government this May.

Winding from Deep Mines.

In the paper on "Improvements in Coal Mining," read before the English Institution of Civil Engineers, Mr. H. W. Martin showed that an important object in the design of winding machinery is to make the demands on the power of the engine as nearly uniform as possible. Many devices are resorted to in order to effect this, and are more or less successful. Two of these are (1) The employment of a balance rope, and (2) The adoption of a drum of varying radii, generally of a conical form.

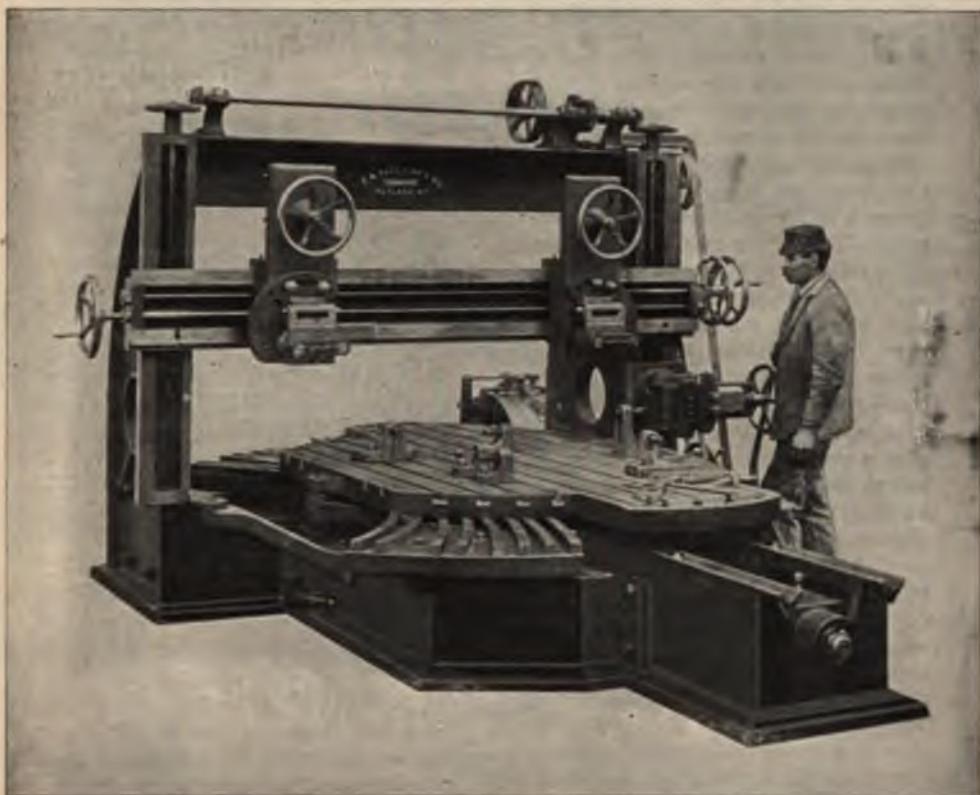
Messrs. Eilenberger and Roof have purchased the machinery of the Pen Argyl Iron Works and will rebuild on the old site and carry on the business of general repairing and dealers in all kinds of quarry supplies.

Philadelphia, Pa.—J. C. Newson has prepared plans for a \$25,000 church to be erected by the Third Moravian Congregation. Rev. F. Elwood Raub.

Newcastle, Pa.—The Welsh Baptist congregational members have decided to erect a \$20,000 church.

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Book Reviews.

REPORT OF THE BUREAU OF MINES. VOLUME VIII.—FIRST PART, 1899. J. M. Gibson, Commissioner of Crown Lands. Archibald Blue, Director of Mines, Toronto: Warwick Bros. & Rutter, Printers.

The publication of this report has been delayed owing to the termination of the Government printing contract, but the delay has permitted the publication of statistics of metallic minerals for the first six months of 1899, which show a decided improvement over the statistics for the corresponding period of 1898. The total number of mining companies incorporated in Ontario during 1898 was 41 and the aggregate of the authorized capital, \$20,862,998. During the year the Crown disposed of 292 mining locations by sale, having the total area of 19,529 acres, and of 506 locations by lease, having an area of 48,911 acres. The mineral production of 1898, including building stone, rubble, etc., to the value of \$750,000, with 1,250 employees, who were paid \$520,000 in wages. The output of natural rock cement was 91,528 barrels, valued at \$74,222, with 85 employees, and wages of \$23,784; Portland cement, \$153,348 barrels, valued at \$302,096, with 220 employees and \$104,350 in wages; lime, 2,620,000 bushels, valued at \$308,000, with 548 employees and \$127,000 in wages; gypsum, 3,000 tons, valued at \$4,000, with 15 employees, and \$2,000 in wages; graphite, 300 tons, valued at \$6,000, with 10 employees and wages of \$1,800; mica, 34 tons, valued at \$7,500, with 15 employees and wages of \$4,500. The number of men employed in the stone quarries last year was 1,250, or 480 more than in the year previous. The production of cement in Ontario is steadily growing larger, there being an increase of 173 per cent. in quantity and 243 per cent. in value since 1894. The graphite mines in Brougham township were worked only six months of the year. A number of new mica deposits have been discovered, but only one of them was a producer last year, the Stoness-Kent Mica mine, in Bedford township. Prof. Courtenay DeKalb, inspector, reports on "The Condition of Ontario Mines." Prof. DeKalb visited the Crookston and Point Ann quarries, which are being operated in Trenton limestone at Crookston. H. Quinland

is superintendent, and 100 men are employed, of whom thirty-five are quarrymen, forty-five stonemasons and twenty miscellaneous laborers. Six ten-ton derricks are set up and there are steam derricks of modern type and two steam drills. The Gibson quarry, adjacent to the former two, has Patrick Farley as superintendent. About eighty-four men are employed, of whom twelve are quarrymen and sixty stonemasons. There are two derricks and three steam hoists. The quarry is worked in four benches and is well laid out and operated in all details. Three steam drills are operated. James A. Bow, inspector, reports on the "Mines of Northwestern Ontario," and David G. Boyd, inspector, on the "Michipicoton Mining Division." Included in the report is the paper by Sir William Chandler Roberts-Austen on "Nickel Extraction by the Mond Process," which was read before the Institute of Civil Engineers, London.

GEOLOGICAL SURVEY OF CANADA. G. M. Dawson, C. M. G., LL. D., F. R. S., Director. REPORT ON THE SURFACE GEOLOGY AND AURIFEROUS DEPOSITS OF SOUTHEASTERN QUEBEC. By R. Chalmers. Ottawa. S. E. Dawson, Printer.

With the excitement that has attended the exploitation of the gold fields of the Western and Northwestern sections of the Canadian provinces, little public attention has been given to the auriferous deposits of Southeastern Quebec. The present report contains the results of observations during 1895, '96 and '97 in the district from Lake Champlain and the Vermont boundary northeastward to Montmagny county, and from the Province line along the New Hampshire and Maine border, northwestward to the plain of the St. Lawrence valley. Gold is reported to have been first discovered about the year 1823 near the mouth of the Gilbert river, and later a nugget was taken out, the weight of which was 1,056 grains. The first mining operations were in 1846, although nothing of any moment was done until 1864 or '65. It is reported that from 1862 to 1894 gold to the value of \$1,000,000 was taken out by operations in the Gilbert Valley. Mining along the Du Loup began in 1851-52, while work



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was begun along the Famine river in 1864. Along the other rivers work was done in a very spasmodic way until comparatively recently. Mr. Chalmer's report is a careful, intelligent work that will have great value.

THE STATE OF WYOMING: AN OFFICIAL PUBLICATION CONTAINING RELIABLE INFORMATION CONCERNING THE RESOURCES OF THE STATE. Revised, re-edited and published by Fenimore Chatterton, Secretary of State, Cheyenne. S. A. Bristol Company, Printers.

This is an attractive illustrated presentation of the resources of the State of Wyoming. The chapter on "Mineral Resources," by Prof. Wilbur C. Knight, of the University of Wyoming, is a careful and admirable discussion of the subject.

Prof. Knight says that building stones of innumerable varieties are common throughout the State. The stone industry, however, has never been of much more than local importance and only a few quarries have been opened with a view of export trade. Granite, sandstone, limestone, quartzite, serpentine, marble and marble onyx are included in the varieties. The majority of these are found in inexhaustible beds and are unsurpassed for beauty and durability. Veins of graphite are known in several of the counties and the ore is of the amorphous variety. Mica is very plentiful in the State and in one or two places it has been worked for shipment. There are deposits of asbestos in three counties, but the long distance from the railroad forbids profitable working.

FIFTH ANNUAL REPORT OF THE COMMISSIONERS OF PUBLIC ROADS OF NEW JERSEY FOR THE YEAR 1898. Henry I. Budd, Commissioner. Trenton, N. J.: The J. L. Murphy Publishing Company, Printers.

No State in the Union has better roads than New Jersey. This is not alone because of natural advantages possessed by this commonwealth, but because of wise laws and intelligent supervision. The State Aid System has worked admirably

and there has grown up in all parts of the State a strong appreciation of what the roads have done for the inhabitants and a demand for the extension of the system. During the year 1898 there were built 84 1-2 miles of improved roads; a greater mileage than has been built before in any one year under the present laws. Specifications for the present year call for the construction of about 95 miles at a total cost of \$333,987.23. Since the State Aid Law went into effect the total number of miles built is 325. The report of Commissioner Budd is full of suggestive comment on road building that will be of great benefit to those communities which have not made the progress in this construction that has marked the work in New Jersey. The commissioner says that observation and experience have demonstrated that the earth, properly drained, is as good a foundation as can be obtained for any road superstructure, and therefore it is not necessary to deposit any more thickness of metal upon the surface than is required to stand up under the wear until the roads have to be resurfaced. This is a great item of economy over former road construction. The principal construction of the State recently has resolved itself into roads four, six and eight inches deep. In localities where there are great quantities of stone lying around loose in the fields alongside of the roads the large stones are turned cheaply into the bottom, forming a telford foundation upon which a base of three or four inches of cracked stone is placed. The surfaces of roads are also maintained cheaply. An application of coarse sand, or gravel and loam, in which there is oxide of iron, will maintain the integrity of the surface by keeping the wear of the wagons and horses' shoes from the stone, and making a soft cushion for their feet. These coatings also prevent the powder that binds the stone from blowing away, and keep the necessary amount of moisture beneath to maintain the cementation qualities of trap stone dust, which, when moist, is a most powerful agent in binding broken stone together. The average width of macadam roads varies in different countries. In the United States it is sixteen feet; in France between sixteen and twenty-two feet; in Belgium 8 1/4 feet; in Austria from 14 1/2 to 16 1/4 feet, and New Jersey has settled upon the widths of 10, 12 and 14 feet as ample

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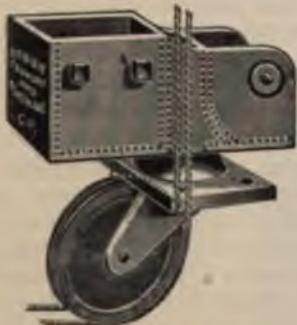
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for the traffic in the country, and 16 feet in the town as the limit for State Aid. Then, if the municipalities through which they pass, or the citizens thereof, decide that the whole street shall be covered, they improve the remainder at their own expense.

In the early history of the State Aid System in New Jersey the farmers, except in two counties, were opponents of the proposed law, fearing that it would burden them with taxes. The wheelmen came before the Legislature and by their efforts the law was passed. Now the wheelmen are comparatively quiet while the farmers are the pleaders and workers and have filed hundreds of petitions for new roads and are daily filing more. The reason for this change of attitude on the part of the farmers is the direct financial benefit they have received from the improved roads, benefits which are forcibly stated by Commissioner Budd. Another result is that farmers are rapidly buying larger and heavier wagons with broad tires.

The report gives the result of studies of the different kinds of road metal, including trap, limestone screenings, Marcellus shale, gravel, etc. Included in the volume are a paper on "Road Building," by James Owen, C. E.; "Opinions of Representative Citizens About State Aid for Hard Roads," amended form of specifications used for macadam construction under the State Aid Law, and the law itself, with amendments. The tables of cost and amount of materials required are also a valuable feature of the book.

PROCEEDINGS OF THE ELEVENTH ANNUAL MEETING OF THE IOWA ENGINEERING SOCIETY, held at Iowa City, Ia. Published by the Society. Price, \$0.50.

Besides the minutes and reports of the annual meeting this handbook contains a number of interesting papers. Those of particular interest to readers of this magazine are "Public Roads of Linn County," by J. H. Lary; "The Uses of Cement," by B. Schreiner; "Some Experiments Relative to the Standard Methods of Testing Paving Brick," by Anson Marston and J. H. Wyckoff. The discussion of the various papers is interesting and valuable.

Cost of Poor Roads.

As the result of an inquiry made in 1873 by the United States Department of Agriculture, replies were received from 120 counties, giving the cost of hauling crops in various parts of the United States, say "The Tradesman." The average load hauled was found to be 2,002 pounds; the average length of haul, 12.1 miles; the average cost of hauling a ton of crops to market was \$3.02; while the average cost of hauling a ton for a distance of one mile was 25 cents.

A recent careful investigation shows that the average cost of hauling one ton one mile in England is 10 cents; in France, 10 cents; in Germany, 8½ cents; in Belgium, 9½ cents; in Italy, 7½ cents; and in Switzerland, from 6 to 8 cents, the average for all these European States being 8.6 cents per ton per mile. More than one cause may enter into this determination of cost, but that the great cost in America is due to our poorly made dirt roads is proved by the fact that while over the superb roads of Europe a farmer will haul three or four tons at a load, our farmers are able to haul only a ton or less than a ton over the "plow and scraper" ridge of soil, which even at this late is dignified by the name of road in many parts of the country.

Niches.

The abundant use of statues by the Romans led to the adoption of the niche—a feature unknown in Greek architecture—as a convenient mode of inserting them within the surface of walls and thereby decorating them; at the same time space was gained in interiors where, if otherwise placed, they would have taken up room. Niches frequently occur in Roman temples and baths, and were occasionally decorated with a frontispiece of small columns, with their entablatures and pediments, but were generally left plain, and were for the most part semicircular in plan, in which case they usually terminated in an arch and semidome, after the manner of a tribute or large recess, of which the niche was, in fact, a miniature copy. Niches, however, were very frequently rectangular in plan, and were also exhedrae, or recesses, in which case the latter formed arches vaulted hemicylindrically.

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Curious Pavements.

At Gwandum, in Africa, which contains between 10,000 and 15,000 inhabitants, the town, which is oval shape, is surrounded by a palisade of tree poles, the top of every pole being crowned with a human skull. There are six gates, and the approach to each gate is laid with a pavement of human skulls, the tops being the only parts that show above ground. More than 2,000 skulls are used in the pavement leading up to each gate. The pavement is of snowy whiteness, and polished to the smoothness of ivory by the daily passage of hundreds of naked feet. At Philadelphia compressed grass has been formed into paving blocks, and this pavement has stood a year's test so well that a large industry has sprung up for their manufacture. The grass used is what has grown on salt marshes. Amongst other curious materials which have been used for pavement may be mentioned molasses mixed with sand and compressed into blocks, horses' teeth set in cement, granulated A pavement of glass blocks has been laid cork, india rubber, shells, steel, and glass, in the city of Lyons, in France. The costliest macadam record is that which once paved the streets of Kimberley, South Africa. It was so thickly studded with diamonds that millions' worth of gems were taken from it.

The Formation of Flint.

In a recent number of *Knowledge*, Professor Grenville Cole, writing on the secrets of the earth's crust, tells his readers something about the makers of flint. Three humble groups of organism—sponge, radiolaria, and diatoms—may be regarded as the essential makers of flint. They extract the silica from the sea water, which derives it mainly in solution from the land; they deposit this as colloid silica in their skeletons; on their death, or, in the case of sponges, on the ejection of their spicules, the silica is slowly picked up again by the water, and ultimately comes out in the consolidated rock, in the minutely crystalline form, chalcedony or flint. In this form it is proof against long attacks, though its white exterior, and sometimes its crumbling character throughout, show that some solution takes place, and that the unhappy

organic skeletons are destined to no certain rest. The foraminifera coccoliths, and so forth, and, more rarely, the larger fossils, become completely replaced by the silica as it is redeposited. Similarly the oolitic structure of some limestones becomes preserved in flint, and may even remain in this form when mineral changes have destroyed it in the actual limestone. Why some limestones contain flint and few traces of siliceous organisms, and others are rich in such organisms, is a question that has been raised and is still under discussion. In some cases a rock may be full of casts of siliceous sponges and radiolaria, and yet the silica may be entirely withdrawn.

Progress on the Siberian Railroad.

According to official statements, the traffic of the completed section of the Siberian Railroad exceeds all expectations. In 1898 there were carried 948,000 passengers and 616,666 tons of freight. During the first two months of the present year the amount of freight transported on the Great Siberian Railway amounted to 14,000,000 poods (233,333 tons); and in the month of May, on the Central Siberian Railway alone, 1,200 cars of freight were waiting two months for their turn, being directed to a famine stricken district in the Trans-Baikal. During the first two months of the present year 150,000 workmen and settlers were carried along the Siberian line. On the western portion of the line, since its inauguration, new switches have been built which will permit of the running of 10 trains a day. On this portion of the railway the 50 wooden bridges which existed are being replaced by iron bridges. The long-expected iron bridge over the Yenisei is now ready; it is 2,800 feet long. On the Trans-Baikal line nearly all the grading is ready and the rails are laid for 550 versts (366 miles) from Stretenesk and 70 versts (46 miles) from Muisoff; the total length of this section of the railway is a little over 1,000 versts, or 666 miles. Thus, it is expected that by June of next year this section of the line will be in operation. Ten thousand workmen and convicts are working at the Chinese section of the line, which it is expected will be completed in three years.

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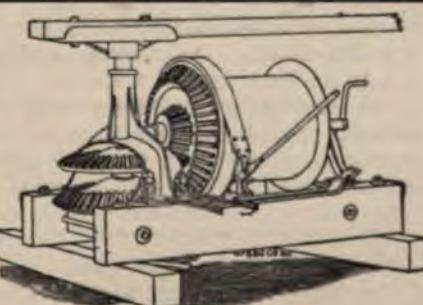
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Scandinavian Granite.

The exportation of granite from the Scandinavian countries last year was the largest on record, says the English "Stonemason." Great Britain and Germany were the two largest customers. The bulk of the exportation of this article takes place from the Frederickshald, Fredrikstad, and Sarpsborg districts, but smaller quantities are also shipped from Christiania and other places on the west side of the Christiania Fjord. Considerable quantities are also quarried at Bohuslan, in Sweden, for Norwegian firms, as the labor there is cheaper. The greater part is shipped in the form of curbstones (*kantsten*) and streetpaving sets, and, it is said, finds much favor abroad.

Although labor can be obtained at a cheaper rate per hour in Norway and Sweden than in this country, the product is less, and hitherto it has been found that greater economy can be effected by importing the raw material than by working it in Scandinavia. Doubtless something is due to the better type of machinery which is in use by manufacturers here, but natural aptitude goes far much in stone working, and especially when a hard intractable material like granite has to be dealt with.

Chlorate Explosives.

For producing chlorate explosives, says the London "Colliery Guardian," the Societe de Produits Chimiques et d'Explosifs Berges, Corbin & Cie, Grenoble, dissolves an aromatic nitrogen derivative in a vegetable or animal oil, kneading the solution with a finely powdered chlorate or perchlorate; and the mass may, if required, also receive the addition of coal or a hydrate of carbon. Such an explosive may consist, for instance, of 10 to 20 per cent. of oil solution, 80 to 65 per cent. of potassium chlorate, and 10 to 15 per cent. of starch. Permanent chlorine explosives are obtained if nitro-benzol, nitroxy-benzol, nitro-amido-benzol or dinitro-amido-benzol, separately or together, be dissolved hot in mineral oil and combined with the chlorate, such an explosive containing, for instance, 10 per cent. of nitro-benzol, 10 per cent. of vaseline oil and 80 per cent. of potassium chlorate.

Displacing Hand Labor by Machinery

It is through the steady growth of machinery employment and the reduction of manual labor to a minimum that some of the most telling economies in iron and steel works, in engineering shops, and in mining operation have in recent years, been effected, and in this respect European and American enterprise have profited to most remarkable degrees and have supplied experience which now is being taken at its proper worth in Great Britain as well. At a meeting a short time ago of the Staffordshire Institute of Iron and Steel Managers, the president, Mr. H. Le Neve Foster, urged the importance of following the American practice of adopting mechanical methods to the fullest possible extent, and stated as a sample of what is already being done in this direction that pig-iron casting machines are now being employed at some of the North of England blast furnaces with a saving of something like 2d. per ton, and that pig breaking machines have been put into service with equally successful results. A saving of 2d. per ton on the pig-iron produced throughout Great Britain last year would mean an economy of £70,000. At Messrs. Bolckow, Vaughan & Co.'s works, tipping gear, which has been erected in the steel blooming mills, had reduced the cost of labor from 1s. 2d. down to 2d. per ton on an output in one mill of 500 or 600 tons per turn of twelve hours. Thus the capital outlay was paid over and over again. In illustration of the importance of further mechanical applications to the mining and quarrying industries, it was mentioned that a reduction of only 1d. per ton in the cost of limestone quarried last year would have represented a saving of £50,000, and a similar reduction on the cost of the coal raised in the country would have meant a saving of over £100,000. Belgians and Germans have been quite as keenly alive as Americans to the importance of economies such as these in their own domains, and have accordingly helped to set a pace which the British works proprietor and manager must follow so as to ward off that destructive foreign competition of which so much has been said and written for several years past.—*Cassier's Magazine* for October.



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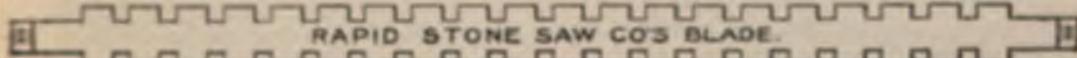
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The Steam Shovel for Mining Iron Ore.

By far the best and cheapest of the several mining methods in use in the Lake Superior region is that by open-cut with steam shovels. This has so far proved applicable only to five mines, which are all in the Mesabi district, viz., the Mountain, Oliver, Ohio, Mahoning and Biwabik mines. The physical condition of the ore here resembles earth rather than rock. It lies on the slopes of the hills in immense masses with little soil above it. The steam shovels used have three separate pairs of cylinders and one boiler. They weigh 92 tons, and are carried on four axles. One machine has filled 232 25-ton ore wagons, or a total of 5825 tons, in nine hours, but this is a record performance. Five tons of ore can be lifted by the machine each stroke, and five full-weight lifts will fill a wagon. The authors watched a 25-ton wagon filled in two and one-half minutes by seven bucketfuls, which is at the rate of 600 tons per hour. The men, exclusive of the trainmen, are required to work the machine, which consumes about 4 cwt. of coal per hour.

A certain amount of blasting is necessary at the "shovel" mines to loosen the soil and ore, and thus facilitate the work of the machine. Holes $1\frac{1}{4}$ inches in diameter are made by driving in pointed steel bars to a depth of 20 feet. These are opened out at the bottom by the explosion of small dynamite charges. Between 25 pounds and 75 pounds of black powder are then poured in, tamped and exploded.

A train of ten or twelve 25-ton wagons is run alongside a steam shovel, and is worked forward by a locomotive as fast as the wagons are filled. It is then drawn out, sorted, and made up into longer trains for transport to the docks.—Jeremiah Head and A. P. Head in Cassier's Magazine for October.

Waterproof Wash for Stone Work.

Resencheck, of Munich, mixes together the powder from three parts of silicious rock (quartz,) three parts broken marble and sandstone, also two parts of burnt porcelain clay, with two parts freshly slackened lime, still warm. In this way a wash is made which forms a silicate if often wetted, and becomes, after a time, almost like

stone. The four constituents mixed together give the ground color, to which any pigment that can be used with lime is added. It is applied quite thickly to the wall, or other surface, let dry one day, and the next day frequently cover with water which makes it water-proof. This wash can be cleansed with water without losing any of its color, on the contrary, each time it gets harder, so that it can even be brushed, while its porosity makes it look soft. The wash or calcimine can be used for ordinary purposes, as well as for the finest painting. A so-called fresco surface can be prepared with it in the dry way.

Our Pneumatic Tools Abroad.

It is reported in London, according to a cablegram received by the New York Commercial, that the British Admiralty has decided to adopt the use of American pneumatic riveters, and other tools driven by compressed air, in the Government ship yards, and that this decision is creating a great commotion among the members of the English trade unions, who apprehend that these labor-saving devices may throw a large number of men out of work. A decision to adopt American tools of these kinds has been expected for a long time among the makers of them here, and there is reason to believe that within a short time a great number of them may be added to our exports to the older countries.

Inquiries made in this city by the Commercial show that the British War Office has already become a heavy purchaser of tools of this sort, presumably for the Woolwich Arsenal shops, that the Midland Railroad has just ordered an equipment of them for its car works, and that many private shops are adding them to their equipment.

The German Government has already adopted them in its shipyards and railroad shops, and shipments are being made to its naval department at the present time. American air compressors have also been recently ordered for use in Paris in connection with the municipal sewerage system; for use in the Lancashire and Midland districts in England; for shops in Berlin, and to operate tools in the oil fields of Bahia in Brazil.

SITUATIONS WANTED.

Advertisements under this heading inserted for subscribers to STONE free of charge. Advertiser must send 25 cents to pay postage, if replies are to be addressed in care of STONE. Rate to non-subscribers, 10 cents a line each insertion.

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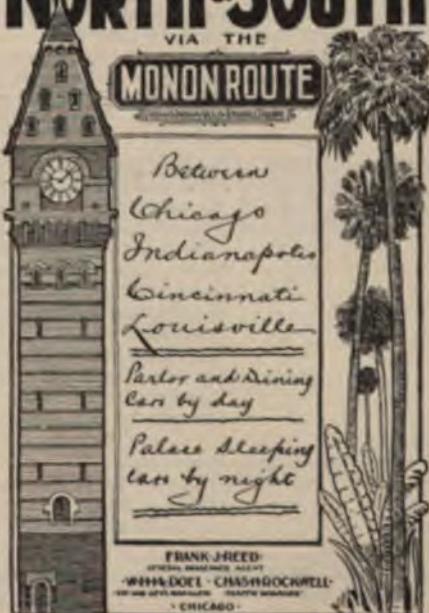
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XIX.

October, 1899.

No. 5

STONE

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MEMORIAL TO LADY POLE AND HER CHILDREN.

THE NEW YORK
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VOLUME XIX.

OCTOBER.

NUMBER 5.

CATHEDRAL OF ST. JOHN THE DIVINE.

Tis to be expected that New York, as the metropolis of the United States and the greatest business city of the world, would have some notable works of architecture, but it is a surprise to a visitor and a pleasure to a resident on alighting at the 116th Street West Side Elevated station to view the remarkable collection of great works of architecture which have been and are being erected upon Morningside Heights. The best known is the Grant Monument on Riverside Drive, seen from the station to the extreme north of the group. Next to the south is the Low Memorial Library of Columbia College, with its remarkable dome and beautiful portico. Then the great buildings of St. Luke's Hospital, with their pleasing sky lines and remarkable ensemble, are seen just north of the Cathedral of St. John the Divine, which is in process of construction. St. Patrick's Cathedral on Fifth Avenue, just below Central Park, is the pride of American Roman Catholics, and has been the Mecca of students of cathedral architecture who could not visit the great churches of Europe, and the new Protestant structure, in its commanding position on the eastern brow of Morningside Heights, will add another cathedral to New York's list worthy of a long trip for the study of its construction and architecture.

The building has proceeded quite slowly for some years, and until recently only the foundations were in and some progress made on the pillars for the support of the great arches. The crypt has been roofed over temporarily and services are being held there. The arch, shown in the view, was carried up past the springing as far as possible without centering, when the derricks were raised up to their present position by gin poles. After they were securely placed and guyed in position the centers were raised into place in sections as they had been framed on the ground. First the two inclined struts of one rib were set in place, having the vertical at the center attached to them; then those for the other ribs were placed and all blocked up to the proper level. While these timbers are not a necessary part of the



ARCH IN THE CATHEDRAL OF ST. JOHN.

centering, they add much to its stiffness and were very convenient supports on which to place the curved trussed rafters which form the centering proper, and which were set in place separately. When the two sections of each of the six ribs were in place, they were planked over and all was ready for laying the voussoirs.

The voussoirs, or arch stone, had been cut previously, so that only a few days was consumed in laying the first course and setting the keystone. Since the view was taken the remainder have been laid and the arch completed. Similar processes will be carried out in turning the remaining arches until the whole is complete.

The construction of the pillars and masonry is clearly shown in the view, and also of the timber work for the centering. In the foreground can be seen the foundations for the apse, while back of the partly completed arch can be seen the other pillars under construction.

Eight columns of granite are to support the central dome, and one of these has just been cut from the solid rock at the Palmer quarry, five miles north of Vinalhaven, Me. A correspondent gives the following account of this great achievement in quarrying: "This monolith measures in the rough

state 64 feet in length, 8 feet 6 inches long by 7 feet in width, and the total weight is 310 tons. It is one of the most remarkable blocks of stone ever quarried anywhere in the world. When this is turned into cylindrical form it will be 54 feet in length and 6 feet 3 inches in diameter. Only one other of the eight columns will be of this size, while the remaining six are to be of the same diameter and 52 feet in length. The process of quarrying such a shaft was a long and laborious one, and the work of removing it also presented many mechanical problems. The longest lathe for turning stone does not exceed 30 feet, and consequently for the finishing of this column a special lathe was required, which is being built at the cost of many thousands of dollars. When the column shall have been suitably dressed, the removal to New York will be a matter of great moment. The risk of handling it without injury is great and no ordinary craft will serve as means for transportation. It is probable that some large vessel will have to be chartered, or that a special one will have to be made. Previous to the present, the largest monolith ever quarried at Vinalhaven was the one used for the General Wool memorial in New York City, but this weighed only 175 tons."

The most striking plans, we believe, that have ever been prepared for an American cathedral were those by H. H. Richardson for the proposed structure at Albany, but taking into account the commanding location of St. John's it is only fair to assume that its appearance will be very much superior.

CHARLES EVAN FOWLER.

A BEAUTIFUL MEMORIAL.

HE memorials to the dead erected in this country will bear comparison with those that can be shown in any other land. But as a general rule they take the form here of open air monuments and mausoleums. Comparatively little is done in the way of erecting mural tablets. Our churches, as a rule, do not lend themselves to this purpose owing to their methods of construction and interior finish. Many of our older churches have simple tablets in memory of former pastors or church officials, but these are generally simple slabs bearing an appropriate inscription. Richly sculptured tablets could almost be counted on the fingers of one's hands. The principal reason for this is not difficult to understand, although it would be hard to put it into exact words. Our social conditions and the methods of church government that obtain in this country will account for the absence, in great measure, of these striking memorials. From the artistic standpoint the loss is a serious one, for no form of sculptured tribute to the dead offers richer opportunities for rich and chaste effects.

The publisher of STONE takes pleasure in presenting this month a very striking and beautiful mural sculpture recently erected in St. Michael's Church, Shute, England, from the studios of Harry Hems & Son, Exeter. It is a memorial to Lady Pole, a member of one of England's oldest families, which has taken a prominent part in the history of the kingdom, and her three daughters. All of the figures are portraits and the subject is the meeting of mother and children in Paradise after thirty years' separation.

STATE AID ROADS IN NEW JERSEY.



NEW JERSEY stands pre-eminently at the head for good roads. While Massachusetts, Connecticut, New York and many other States have done much in regard to the improvement of their highways, New Jersey leads them all and is carrying out her improvements in connection with State Aid on well defined lines. The plan of State Road Commissioner Budd to have a continuous macadamized roadway from Cape May to the New York State line, and from the Hudson River to Easton, Pa., is most commendable, and from the progress already made will not be long in accomplishment.

State Aid for roads in New Jersey has done more than the mere contribution of money. It has stimulated municipalities and corporations in all parts of the State to extend their good roads at their own expense. This is particularly noticeable in Central New Jersey through the towns contiguous to the large railroad lines, a railroad station as a rule being the central point of agitation.

It is a singular fact (now that the great benefits are seen) to realize that in the beginning the appropriation from the State was opposed on all sides. Now the demand is so great that if the appropriation was \$300,000 per year, in place of \$150,000, as it now is, it would find ready customers. A résumé of the work done to date (Report of State Roads Commissioner for 1898) makes interesting reading:

Built in 1893-4	74 miles.
Built in 1895	46 miles.
Built in 1896	51 miles.
Built in 1897	66 miles.
Built in 1898	84 miles.

Applications on file approved by the Commissioner aggregate **95 miles**, to cost about \$335,000. Total to Oct. 31, 1898, 325 miles, at a cost to the State of \$565,000. While the southern counties of the State have benefited largely by this fund, the upper counties are asking and receiving a larger share than formerly, and we find that Essex County has made about **27 miles** and had the benefit of about \$50,000 of State Aid money, representing about \$225,000 spent for hard roads.

It should be borne in mind that the State pays $2\frac{1}{3}$ per cent., the property owners 10 per cent., and county $66\frac{2}{3}$ per cent. Since the report of the State Roads Commissioner was received, Essex County has started or completed the following roads:

GROVE STREET, MONTCLAIR.

This is one of the oldest highways of the State, known as the old Telegraph Road, built over 100 years ago, and the means of communication

from the Oranges and points below through Montclair to Paterson. It has a large travel, is very picturesque and a delight to the bicyclist.

GROVE STREET, VERONA.

This is a connecting link from Verona, at Bloomfield Avenue, to the Pompton Turnpike, and so on through Singac, Mountain View and Pompton to Greenwood Lake. Pompton Turnpike, embracing within its lines a road partly in Essex County and part in Passaic, was built by State Aid.

FRANKLIN AVENUE, BLOOMFIELD.

Connecting the Bloomfield system of roads at the head of the plane of the old Morris Canal with the Franklin and Belleville systems near Franklin, N. J.

WALNUT STREET, LIVINGSTON.

A connecting link with the Essex County system of roads and the north-western system of the county to be further extended. A great benefit to the farmers of that section and greatly appreciated by them.

SOUTH ORANGE AVENUE.

A continuation of the county roads of same name already made and carried over the mountain about three and one-half miles to the townships of Milburn and Livingston. A very difficult and expensive piece of work, but of



LAYING A GOOD FOUNDATION, MONTCLAIR.

Watchung Ave., near Upper Mountain Ave.

great benefit. It will be extended north in the early future, and help improve a very large section of territory. This road is contiguous to the large South Park reservation, a part of the Essex County Park system said to be the finest piece of virgin park land in Central New Jersey. These roads cost \$50,000, and are just completed. The roads under construction now by the County Boards of Freeholders are:

BROAD STREET, BLOOMFIELD.

This is an extension of the Bloomfield system of hard roads extending from Bay Avenue, the terminus of the Orange Valley cross town line north to the Passaic County line, about three miles away. This is the main highway north from Bloomfield to Passaic and Paterson, by way of Brookdale and Richfield. It traverses a very rich and prosperous farming country, and the amount of trucking done upon this street is tremendous. For years broken stone was put upon this street for repairs, until at least \$10,000 was expended. This was found to be ineffectual, and the old lines of fence and grades are being changed and a heavy ten-inch Telford placed thereon. This is destined to be one of the principal highways of the county, for the trolley line spoken of before is to be extended to Paterson and Passaic along this road. This, with an extension from Brookdale to Upper Montclair, as soon as the Valley Road line at Montclair is extended to Paterson, will make a connecting link that will be invaluable, becoming, as it will, part of the universal system of the North Jersey Street Railway Company. The trolley, and the hard roads, are a necessity and should go hand in hand.

MT. HEBRON ROAD, MONTCLAIR.

This is a connecting link from Broad Street, Bloomfield, to Valley Road, at Montclair Heights, there connecting with the Montclair system of hard roads. A little further on connection is also made with the Little Falls road of the Passaic County system, which reaches out to the north by way of Little Falls.

BAY AVENUE, BLOOMFIELD AND MONTCLAIR.

A short section commencing at Broad Street, Bloomfield, and running through the borough of Glen Ridge and township of Montclair to Walnut Street, Montclair, there connecting with the Montclair system of hard roads.

The Fairfield road and the extension of Bloomfield Avenue at or near Caldwell are also under way, and when completed will be of great benefit to the upper section of Essex County, and will lead to further extension into Morris County. This, with the improvement on Watchung Avenue, more fully described later, represent an expenditure of at least \$75,000.

Among the many roads now petitioned for in Essex County are East Passaic Avenue in the township of Bloomfield, commencing at Franklin Avenue, Bloomfield, and running north and parallel to the Morris canal to the Passaic County line; Roseland Avenue, near Caldwell; Eagle Rock Road, near Orange; the Mountain Road and the North and South Midway. These will cost about \$40,000.

WATCHUNG AVENUE.

Watchung Avenue, now being macadamized by the Forman Stone Supply, of Newark, with a large force of men and teams under State Aid, lies



FISHING A STATE AND ROAD WATCHUNG AVENUE, MONTCLAIR, N. J.

about a mile north of Bloomfield Avenue, Montclair, and commencing at Mountain Avenue runs through the township of Montclair, borough of Glen Ridge and township of Bloomfield, to Broad Street, Bloomfield, a distance of about a mile and a half. Some of the finest landscape paintings of America's noted artist, George Inness, were taken from this locality, and one needs but to see it now with its changing autumn foliage to appreciate the beauty of its situation. The lower portion of the avenue, known for many years as Oak Tree Lane, now about completed, shows a transformation from a rough, unbroken byway full of stones, brush and general forlornness to a modern highway.

The section through Montclair was made to conform to the full width and grade required for modern roads years ago, and so did not require any radical change in form except as to macadamizing.

Acting as it does as a drainage for a large section of the mountain, great care in the work has been exercised. Crossing as it does many important thoroughfares from Montclair, it is bound to be greatly traveled. No more important street in Essex County has been macadamized under State Aid. Under this avenue runs the supply pipe of the East Jersey Water Company, feeding the well of the Montclair Water Company, near Valley Road, and also the lower levels for Montclair down Park Street and Valley Road, which eventually lead to Glen Ridge and the upper section of Bloomfield township. From the well spoken of, another pipe leads to a large tank on the mountain. This gives a double pressure on the pipe that feeds the upper levels of Montclair.

As all the roads named have been built under one general form of contract and specification, and copied as they are in many other places until perhaps \$1,500,000 has been spent, suppose we quote them verbatim:

ROADWAY—SUB-FOUNDATIONS.

When the excavations and embankments have been brought to a proper depth below the intended surface of the roadway, and the cross-section thereof, conforming in every respect to the cross-section of the road when finished, the same shall be rolled with a two-ton roller until approved by the engineer. If any depressions form under such rolling, owing to improper material or vegetable matter, the same shall be removed and good earth substituted, and the whole rerolled until thoroughly solid and to above-mentioned grade.

After the roadbed has been prepared and properly rolled, it shall not be disturbed by any carting or hauling upon the surface.

TELFORD FOUNDATIONS.

After the roadbed has been formed and rolled, as above specified, and has passed the inspection of the engineer and supervisor, a bottom course of stone, of average depth of five inches, to be set by hand as a close, firm pavement, the stones to be placed on their broadest edges lengthwise across the road and so as to break joints as much as possible, the breadth of the upper edge not to exceed four inches. The interstices are then to be filled with stone chips, firmly wedged by hand with hammer and projecting



A FARREL-BACON STONE CRUSHING PLANT, MONTCLAIR.

points broken off. No stone to be used of a greater length than ten inches or width of four inches, except each alternate stone on outer edge, which shall be double the length of the others and well tied into the bed of the road; all stone with a flat, smooth surface to be broken. The whole surface of this pavement to be subjected to a thorough settling or ramming with heavy sledge hammers and thoroughly rolled with a five or two-ton roller. No stones larger than one and one-half inches to be left loose on top of Telford.

BINDER BETWEEN FIRST AND SECOND COURSE.

On the Telford course of stone a quantity of approved binder shall be spread in a uniform layer, and the rolling continued until the stone cease to sink or creep in front of the roller; water will be applied in advance of the roller, but not in excess. The quantity and quality of this and all other binding to be at all times subject to the approval of the engineer.

SECOND COURSE OF BROKEN STONE.

The second course of broken stone shall consist of one and one-quarter inch stone, that is, every piece of stone shall be broken so it can be passed through a ring one and one-half inches in diameter, and no stone shall be more than two inches or less than one inch long. This course is to be spread in a uniform layer of sufficient thickness to make the macadam at least _____ inches and _____ inches in depth respectively, when completed, including the three-quarter inch stone and screenings for the surface,

STONE.

and rolled until thoroughly settled into place to the satisfaction of the engineer and supervisor.

SURFACE.

When the two courses are rolled to the satisfaction of the engineer and supervisor, a coat of three-quarter inch stone and screenings to be spread of sufficient thickness to make a smooth and uniform surface to the road, then again thoroughly rolled until the road becomes thoroughly consolidated, hard and smooth, and a small stone placed on the surface will be broken before being driven into the bed.

Rolling to be done by contractor with a two-ton steam roller, approved by the engineer.

Any depressions found during the rolling, or from any other cause, are to be filled with three-quarter inch stone and screenings, and the roadway brought to a proper grade and curvature as determined by the engineer.

Water must be applied in such quantities and in such manner as to completely fill all the voids between the broken stone, with the binding material saturated so as to secure a set.

MANNER OF ROLLING.

In the rolling the roller must start from the side lines of the stone bed and work towards the center unless otherwise directed. The rolling at all times be subject to the directions of the engineer and supervisor, who may, from time to time, direct such methods of procedure as in their opinion the necessities of the case may require.

QUALITY OF MATERIAL.

All stone must be as nearly cubical as possible, broken with the most approved modern stone crushing machinery, free from all screenings, earth and other objectionable substances, of uniform size and the same kind and quality, or equally as good in every particular as that shown in the engineer's office. The one and one-quarter inch stone, three-quarter inch and screenings for binder and final finish must be of the best traprock, free from loam or clay.

SHOULDERING.

A shoulder of firm earth or gravel is to be left on each side extending at the same grade and curvature of road to side ditches or gutters. This shoulder is to be thoroughly rolled for its entire width on each side of the stone bed.

When necessary the side ditches or gutters are to be excavated as per stakes furnished by engineer, to give an easy flow of water, so that no water shall be left standing on the road or in the ditches, for all of which no extra payment will be made.

MATERIAL USED FOR ROAD MAKING.

The material to make the bottom course of the pavement on Watchung Avenue has been gathered from all sides; from the fences in the immediate neighborhood, from Great Notch, Caldwell, Verona, Cedar Grove and Upper Montclair, near by, stone accumulated in the line fences of the farms

adjoining the avenue for the past 50 years; stone of all kinds, trap, granite, nigger heads, hard and round, pudding stone, bluestone and hard flinty cobble. To this has been added trap taken from the old Piaget farm at Great Notch, adjoining the new reservoir of the East Jersey Water Company, built to augment the water supply for local territory, and perhaps later, Newark and New York, through the Hudson River tunnel (now soon to be finished) as originally planned. This trap is in front of a large basaltic formation, several hundred feet high, upon the top of which stood some years ago a signal station of the U. S. Weather Bureau. This is one of the highest landmarks in this section of the country, and can be readily seen by



STOPPED TO HAVE A PICTURE TAKEN, WATCHUNG AVENUE, MONTCLAIR.

the ships at sea as they pass up New York Bay. Trap for the bottom course is also obtained from Upper Montclair, in the neighborhood of the quarries now in operation there. This trap, like that from Great Notch, has become disintegrated from exposure, who shall say how long? Scientists tell us, perhaps, thousands of years. All this is to be utilized in the improvement of highways that the horse, horseless carriage, automobile and other vehicles of commerce may be made to help and benefit man, either for profit or pleasure.

To this road has also been brought the waste rock of the iron mines of Northern New Jersey, more fully described in the September number of STONE. This, like its new neighbor, the trap, represents an exposure on dump of many years, but when brought together they meet on equal terms

to fulfil an object thought out by intellectual man. When this course is finished broken trap rock, in two sizes, is added to complete the road. This broken stone comes also from many places: from Paterson, Mine Brook, Bernardville, Millington, Milburn, Great Notch and Upper Montclair, the last two through a crushing plant erected on Watchung Avenue and more fully described later. It is a singular thing that while these traps come from different points miles apart and are unlike in many respects, yet they are all perfect in nature and pass the criticisms of experts who are called upon to approve of same as to value for road making purposes.

The quarries furnishing this trap send it also to all points in Bergen, Passaic, Hudson, Essex, Morris, Union and Somerset counties, New Jersey, and it is admitted that, as a finishing material, it is the best the world can find. The crushing plant was erected for the purpose of producing the broken stone for the work and has a crushing capacity of 100 tons a day. It has already broken this year in the city of Paterson some 6,000 to 8,000 tons of trap for the concrete under the 51,000 yards of brick pavements laid there. The plant is portable and can be readily taken down and moved from place to place. It was designed by Mr. Earl C. Bacon, agent of the Farrel Foundry and Machine Co., of Ansonia, Conn., who is located in New York. Mr. Bacon has erected some of the largest and most complete stone crushing plants in the United States. Mr. Bacon was also the designer of the railroad crushing plant of the Forman Stone Supply Co., more fully described in the September number of STONE.

The specifications for material used on this avenue differ materially from that called for years ago in other localities. The upper part of Washington Avenue, running from Avondale Crossing, at the Erie R. R., to the Passaic County line, built by Essex County under Mr. James Owen, then and now the county engineer, and now part of the county road system, has a very heavy sandstone bottom, the material having been taken from Koehler's quarry, nearby. The River Road, Belleville, from Eastwood's factory to the Franklin township line, built also under Mr. Owen's supervision, has also a very heavy sandstone bottom, taken from the fences nearby.

The early roads built in Franklin and Nutley by the writer were on sandstone bottoms, the material coming from Koehler's quarry. At Rutherford we find granite bottoms used by Mr. Galloway, under Mr. Owen's supervision. At Belleville the writer used callos trap for bottoms, and in Morristown, on South Street, granite from the surrounding territory. This street is said to be more traveled than any other street in New Jersey of the same length. At Roselle we find furnace slag, from Lehigh Valley, Pa., used; at Cranford, Roselle and Garwood, granite from the waste dumps of Morris County. The original roads in Montclair were built by Mr. James Owen of fence stone of all characters, obtained at Verona and Caldwell. In Southern New Jersey we find the State is using bog ore with great success. In other places selected gravel or stone from the Delaware River, Snake Hill, Bergen Hill, Rocky Hill and many other points, is used.

When certain other sections take up the question of improving their highways a road metal will be found hard by to help them out. As has been

said before, New Jersey's progressive spirit in good road building has stimulated many localities within her own borders as well as on the outside to greater activity in the matter. So let the good work go on until the time shall come when mud will be a thing of the past, and good roads will be everywhere.

C. E. McDOWELL.

Newark, N. J., October, 1899.

THE MARBLES OF VITULANO.

HERE is evidence on every hand of the growing favor in which the classic marbles of antiquity are held. During the past few months there has been recorded in this magazine the attempts that have been made, without success as yet, to form a combination in the Carrara marble fields, which have been worked for many hundreds of years, in order that the production might be carried on according to more modern methods. Although, as stated, this attempt has met with failure, great quantities of the marble are still gotten out in the same primitive and haphazard methods that were followed in antiquity. The splendid Pentelic marbles from Mount Penteles, near Athens, are again being worked, the necessary stimulus doubtless having been given by the extensive work of restoration that was undertaken in connection with the revival of the Olympian games. A month or two ago STONE recorded the work that was being done in the modern exploitation of the ancient Euboean quarries whence the famous Cipollino marbles are obtained.

There are many varieties of marble that were held in the highest estimate by classical builders, decorators and sculptors, which are known only from surviving samples that were worked centuries ago. The quarries themselves have disappeared and been forgotten, but with the enterprise that marks the stone trade of to-day it may be doubted whether there will not be put upon the market such splendid stones as the Nero antico, Rosso antico, Marmo verde pagliocco, and the purple, African and rose-colored antique breccia marbles. At the present time workmen are busily engaged opening up the wonderful quarry at Vitulano, in the Italian Province of Benevento, which Charles III., of Naples, first exploited, and from which he built the splendid palace of Caserta. A writer in the London "Daily Telegraph" gives a most sympathetic account of the beauties of the Vitulano marble, prefacing his statement with the remark that he loves marble. The writer says:

"If I had ever been rich I would have done magnificent building work with it inside and outside, for Nature has given us few things more lovely and satisfying than the fantastic painting and graining of her variegated limestones. The two most beautiful buildings in the world are the Taj Mahal and the Moti Musjid, both all of white marble. They possess a pure and perfect life of their own, apart from architecture, because of their delicious material, which mellows into new beauty with years. And if you asked any great ancient or modern sculptor, from Praxiteles and Pheidias to Canova and Thorwaldsen, what was the ultimate secret of his art, he would tell you it resided in the living glow which gleams under the milky

satin skin of Pentelican or Parian or Carrara stone. These Vitulano marbles are among the richest in the world. I brought once from the Mediterranean a slab of 'pavonazzo,' the 'peacock' sort, which was, by its hues and shadings, more divine to study than most pictures. At Vitulano you get this, and marble of various colors, beautifully veined, some of it rich in shells and crustaces. The colors include reddish gray, dark brown, violet, purple, and lilac. In all the varieties silica preponderates over the calcareous matter, so that it is capable of a very high polish, becoming almost transparent, and resembling jasper. The marble turns into beautiful pillars for columns, balustrades and similar uses. In slabs it becomes suitable for pavements, dulos, stairways, and furniture, while under the chisel of the artist it forms grand architectural ornamentation such as friezes, bosses, capitals of columns, architraves and the like. Charles III. was so proud of the glorious stuff at Vitulano that he shut up the quarries, but now they are open to the foolish world, which goes on building with brick and rubbish and ashlar, when it might employ blocks of 'cipollino' and 'golden pearl,' of 'royal purple' and 'silver vein,' which would only become more delicate and effective as they grew older and softly weatherworn."

¶ COLOR AND DECAY OF STONE.

FIRST ARTICLE ON "THE BUILDING STONES OF WISCONSIN."

SEVERAL months ago, in noticing the appearance of bulletins issued by the Wisconsin Geological and Natural History Survey, STONE took occasion to praise the excellent work being done by that Board. There has just been issued a new bulletin on the "Building and Ornamental Stones of Wisconsin," by Ernest Robinson Buckley, Ph.D., Assistant State Geologist. This is a volume of more than five hundred pages, is attractively illustrated with engravings and contains a number of excellent colored sheets showing the rich building and ornamental stones of the State. The book is one of the best studies of economic geology put forth by any of the States. Wisconsin is very fortunate in its ornamental stones, its granites in particular being known throughout the country for their rich and beautiful colors. The quarry interests in the State, however, are not confined to granite and ryolite, for there is much done in the line of sandstone and limestone. Prof. Buckley says in the introduction: "The meager conception which the people have of the importance of the stone industry in this State is very evident to one who has witnessed the surprise manifested by those who see, for the first time, the many varieties of granite, sandstone, and limestone, represented by the collection of samples in the laboratory of the Survey. Yet the industry in this State is only beginning to be developed. The brown sandstone of the Lake Superior region is used quite largely in some parts of the country, and the indications point to a revival of interest after the depression of the last few years. The granite from many of the quarries of the State has an enviable reputation among granite workers of this and neighboring

States. The home market is consuming each year more of the home product, and eventually, when prices become more nearly uniform, the granites of the Eastern States and foreign countries will be unable to find any considerable market in Wisconsin. There is certainly a bright outlook for the granite industry in the future.

"The limestone is not the least important stone now quarried in this State. Its adaptability to a great variety of uses, and the great number of quarries in the southern and eastern parts of the State bespeak for it an importance second to neither granite nor sandstone. It is one of the largest sources of stone quarried for local consumption, as well as important source of stone for exportation. Not only does it supply building stone, but it is also used very largely in the manufacture of quicklime and materials for road construction."

Prof. Buckley has an excellent chapter on "Necessary Considerations in the Selection of Stone." On the subject of color he says: "Rocks from the same quarry often differ very widely in color. One of the difficulties in constructing a large building is to obtain stone which is perfectly uniform in color. The predominant colors are white, gray, brown, red, yellow, buff, black and green, but a formation is seldom found in which one color is persistent over any considerable area. Even the Oolitic limestone from the Indiana quarries is colored a number of shades of blue and buff.

"The color of a rock is mainly a composite color formed by a blending of the different colors of the constituent minerals. Occasionally a rock is very unevenly colored, each mineral particle being sufficiently large to retain its distinctive color, as in the case of certain of the coarse-grained granites. But in the igneous rocks, as a whole, the color approaches nearer to what has been called a composite color than it does in any of the other rocks. The gray color of granite is not a uniform gray, but is rather the resultant color of an intimate admixture of black and white mineral particles.

"The color of the sedimentary rocks is due mainly to included iron and carbonaceous matter, which imparts to the rock various shades of blue, brown, buff, red, gray and black. The iron usually serves as a cement, binding the original particles together, although it may be also an original constituent in the shape of finely disseminated particles. Frequently the color varies widely, not only in the same quarry, but even in the same bed. The coloring matter occasionally distributes itself very curiously through the different beds forming what is known as variegated stone. At times the color is distributed through the beds in regular bands, while it not infrequently forms very irregular, fantastic figures. Occasionally a white sandstone occurs in which large and small brown spots may be observed, and again a brown sandstone may be found having similar white spots. Certain beds in a quarry may have a delightfully cheerful, uniform color, while others above and below may be dull and somber.

"The color of a rock when freshly quarried may be almost perfectly white, but after a few months of exposure in the wall the color may change to a buff or the stone may be streaked with irregular patches of brown. Such discoloration depends chiefly upon the presence of impurities within the

stone itself. The yellow color of many limestones is often due to the presence of finely disseminated iron sulphide. If the stone contains either the sulphide or the carbonate of iron discoloration is a natural consequence of exposure to the atmosphere, and such stone often weathers buff after a few years' exposure. The oxides of iron are more stable compounds than the sulphide or carbonate and are less liable to alteration.

"Discoloration on the face of a wall may be due to impurities in the mortar, cement, or brick used in the construction, which are brought to the surface through capillarity. The committee appointed to investigate the cause of the brown iron oxide stains on the walls of the new State Historical Library building at Madison, Wisconsin, concluded that the only sufficient source of ferrous iron was the cement used in the construction of the wall. The Bedford limestone was reported to be practically free from ferrous iron, and the cause of the iron staining was attributed to the cement used in the back wall. How much of the staining, in this case, should be attributed to impurities in the stone and how much to the accessory materials, is still a question, yet it is believed that not infrequently the iron rust discoloration on the face of a stone wall, may be due to impurities in the mortar, cement, or brick, rather than to the impurities of the stone. A common preventative against the ferrous iron in the brick or mortar of the back wall coming to the surface, is a coat of asphalt between the back wall and the stone facing. A better precaution would be to select lime, cement and brick, in which it is certain that ferrous iron is not present.

"The dark colored rocks, brown sandstone for example, after long exposure, occasionally take on a lighter tint, owing to the loss of iron oxide from the exposed surface. This discoloration is not an important consideration. As a rule the discoloration occasioned by the decomposition of iron sulphide and carbonate is deleterious only to the light colored rocks. The dark and the gray limestones are both often discolored by spots or irregular efflorescent patches, usually calcium or magnesium sulphate, which appears as a white precipitate on the surface. As previously explained, this is due to the evaporation of the interstitial water which comes to the surface through capillarity. The color of a rock, as it comes from a quarry saturated with water, is generally different from that of the seasoned rock. The water generally changes the color of a white or buff stone to a bluish gray.

"Very often, through long exposure in the quarry, a rock, such as the blue limestone of the Trenton formation, may be partially weathered along the joints, leaving a blue core surrounded by a buff colored margin. Near the surface, these beds, which were originally blue, are often completely altered to buff, while deeper in the quarry they are but little changed.

"The manner in which a stone is dressed sometimes affects the permanency of its color. A rough dressed stone furnishes a million places for dust and dirt to lodge, while a smooth dressed stone is free from such lodgment places. Thus there is less danger of the original color being obscured in a rock with a smooth dressed face, than in one with a rough face. On the other hand, any irregularity in color that may be inherent in the stone is emphasized on the smooth more than on the rough dressed

face. These imperfections may be more unsightly than the discoloration occasioned by the lodgment of smut and dust, and in such a case, it would be preferable to rough dress the stone.

"There are many other variations in color among the sedimentary rocks, but the above mentioned are the principal ones with which we may come in contact in our study of Wisconsin building stone.

"The market value of a stone is often influenced by its color without regard to its strength and durability. The market value of stone, as well as other products, is controlled by the law of supply and demand. The supply of a certain kind of stone may remain constant, but the demand for that stone may fluctuate on account of fashion. In stone, color, as a rule, is the only element which is subject to the influences of fashion. Until a few years ago brownstone was all the rage, both for business blocks and residences, but the eye became weary of gazing at long rows of somber colored buildings, and the fashion changed to a light colored stone, where it now rests, awaiting the next reversal. Immense quantities of light colored stone are now being used, but its prestige is only temporary. The tide will swing back again in a few years, and it is to be hoped that the halt will be made at a place where the use of neither dark nor light colored stone will be supreme. A judicious use of both will serve to relieve the monotony occasioned by long rows of somber brownstone buildings or the dazzling glare of white limestone and marble.

"In our large cities, other things being equal, the permanence of color, considering both external and internal causes, ought to be a factor worthy of consideration in the erection of flats and residences, but it scarcely warrants serious attention in the construction of business blocks. A white limestone or marble structure erected in the midst of the business portion of a large city, soon loses its original color, becoming gray and dingy from the smoke and dirt that fills the air. If the limestone is bituminous and contains a small amount of oil, it will be certain to collect all the dust and smoke which chance to fall upon it. In the suburban and residence parts of the city and in the rural districts, where both smoke and dust have little effect, the original color will not suffer so much from external causes alone. In the business section of our large cities, the walls of all the buildings become so begrimed with smoke and dust that it is barely possible to tell which were originally constructed out of light and which out of dark colored stone. One has to familiarize himself with the different shades of brown and gray, characteristic of different colored stones, after they have been steeped in a smoke and dust laden atmosphere, in order to be able to determine their original color. On the whole, the darker colored stone shows much less than does the light colored the effects of the smoke and dust. It is true that long rows of brownstone buildings are not very enlivening, but since all buildings generally approach this color after a few years, without respect to their original color, this has little weight as an argument against the use of brownstone. The only consideration in the selection of stone to be used in the business portions of a large city, ought to be one of strength and durability. In the residence portions of the city, where beauty is one of the chief ends of architecture, a judicious scattering

of buildings constructed out of light and dark colored stone, adds very materially, not only to the appearance of the street as a whole, but also to the beauty of the dwellings individually.

"Thus far the discussion of color has pertained solely to stone used in outside constructional work. When used for inside ornamental purposes, a stone does not suffer materially from atmospheric agencies, and the color will ordinarily remain permanent. The selection of stone, then, becomes merely a question of taste. A color which harmonizes with the surroundings, or matches the other work, is generally considered most appropriate. In the flooring or steps, the color should not be the controlling factor, but rather the capacity which the stone has to withstand abrasion, and the tendency which it has to become slippery.

"For monumental purposes the taste of the purchaser is again the main, controlling factor, although durability should be first. The stones used for monuments are mainly igneous and metamorphic (granite and marble), and should not contain elements which will result in discoloration. If a stone contains such elements it is a serious defect. The fact that most of the water which falls on a granite monument is shed by its polished surfaces, prevents decomposition, thereby lessening the danger of discoloration.

"In the more common uses which stone is put, such as road making, sidewalks, retaining walls, cribs, breakwater, bridge abutments, etc., the element of color scarcely enters. In the case of retaining walls and sidewalks, which are partially ornamental in nature, color sometimes enters as a lesser consideration."

Prof. Buckley also writes at length on "The External Causes of Decay in Stone," a matter of such importance that we quote at length what he says concerning "Man's Ignorance and Negligence:"

"The natural forces of destruction have been very greatly accelerated, either through the ignorance of quarrymen and their total disregard for proper time and methods of quarrying, or through the carelessness of workmen in cutting, carving and laying the stone used in building construction. There are probably thousands of buildings, constructed out of stone, the lives of which have been shortened at least one-half by improper methods of handling. Many of the once handsome and imposing structures of New York, Boston and other large cities, after but a century of exposure to the atmosphere, are in a helpless state of decay. This is certainly not due entirely to the handling and setting of the stone, but any inherent weakness in the stone has, nevertheless, been augmented thereby. Certain kinds of building stones, unless they have been thoroughly seasoned, are more injured by freezing than others. I have previously mentioned the resistless pressure exerted by water when it passes from the liquid to the solid state. It is sufficient to say that there are many instances where the freezing of a stone, saturated with water, before it has been seasoned, has largely destroyed its usefulness. Where the pressure occasioned by the freezing of the interstitial water is not sufficient to completely shatter the rock, it often loosens the individual grains in such a manner as very materially to lessen its strength. When such blocks are placed in the wall of a building,

they become weak spots, where disintegration is most rapid. It is necessary that at least the water of saturation be driven off before the rock is used in the construction of a building. As a rule, quarrymen are acquainted with the effects of frost upon stone which has not been seasoned, and observe the necessary precautions. But there are quarrymen, interested solely in the disposition of their stock, who impose upon the ignorance of the public by selling stone which has not been seasoned, and which is, therefore, unfit for use. Stones should be seasoned not only to escape the danger of freezing, but on general principles they should always be thoroughly seasoned before being placed in the wall. Men do not build houses out of green lumber, neither should they construct them out of 'green' stone.

"Improper methods of quarrying also materially shorten the life of stone. In many instances I have found quarrymen moving stone with heavy charges of powder, or even dynamite, expecting to obtain dimension stone for building purposes. The heavy charges of powder not only destroy a large amount of the stone, but they also impair the blocks, which may accidentally remain in sufficiently large dimensions, by shattering the cement and producing incipient joints. The destruction of the cement and the production of incipient joints not only weaken the rock, but also facilitate the entrance of water, with the attendant dangers from freezing, with which we are already familiar. This method of quarrying not only materially lessens the value of the salable stone, but hundreds of tons of otherwise marketable stone is absolutely destroyed.

"So far as is practicable, when quarrying, advantage should be taken of the natural joints in the rocks. Many of the quarries are traversed by planes of parting, by which the rock is broken into polygonal blocks of such dimensions as to be easily quarried. Whenever blasting becomes necessary, the Knox system of small charges, properly distributed, is by far the preferable method to employ. This method is not free from all the evils of blasting, but is the least injurious of any method yet employed. A still better method of reducing the stone to dimensions that can be easily handled, is by the use of the channeling machine. Especially in working sandstone and soft limestone, this machine can be employed to advantage.

"The use of heavy hammers and sledges in splitting the stone, by striking continuously along one line, shortens the life of the stone in the same manner as heavy blasting, by producing incipient joints and loosening the individual grains by cracking the cement. Much care should be exercised in quarrying the stone in order to prevent these unnecessary injuries. Nevertheless, considering the carelessness with which stone has been quarried in the past, it is not so much a wonder that the walls of certain buildings are so soon beginning to crumble as it is that they have not decayed long ago.

"The time of cutting and dressing a stone may also influence in a small way its life. It is generally known that, during the process of seasoning, the water which comes from within the rock and is evaporated at the surface, deposits mineral matter which forms a crust on the surface of the stone. This crust may be formed entirely by the evaporation of the original interstitial water, or it may be added to by water which has soaked into the

stone at a later period and been subsequently brought to the surface. That water which has been called the water of imbibition probably carries a much larger percentage of mineral matter in solution than the water of saturation. The water of imbibition is the last of the quarry water to leave the stone and therefore the crust is not likely to be well formed until the rock has been thoroughly seasoned. If the stone is to be seasoned before being placed in the wall, it is advantageous to have it first cut, dressed, and carved. Not only is it advantageous to observe this rule from the standpoint of future durability, but also from the fact that the stone often works much more readily when first quarried, than it does after it has been seasoned. After a crust has once formed on the stone it should not be broken, because the softer rock underneath, when exposed at the surface, will disintegrate much more rapidly. For these reasons, stone should be worked and finished ready for laying in the wall, before it has become thoroughly seasoned.

"The manner of dressing a stone also influences in a small way the length of its life. A stone which has polished surfaces, sheds water much more quickly and is disintegrated much more slowly than a stone with a rough surface. The stone with a rough surface has many crannies and crevices in which the water collects. Part of the water thus collected is finally absorbed by the rock. It often carries with it carbonic, sulphuric, or other acids which aid in the decomposition of the stone. The addition of water also increases the danger from freezing.

"Sandstone that has been hammer dressed, is liable to disintegrate faster than that which has been sawed. This is due to a shattering of the cement, by the impact of the hammer, in those that are hammer dressed. No matter how careful the workman may be, there is a tendency in dressing stone with a hammer to produce incipient cracks which are passageways for the entrance of water from the surface. In general it may be said that polished and sawn surfaces shed water most readily, while the rock faced and hammer dressed stones, on account of their rough exterior, absorb a considerably larger percentage of the water which falls on their surfaces.

"The exfoliation of sandstone in the large Eastern cities has been mainly attributed to the fact that much of the stone has been laid on edge instead of on the bed. Laying stone on edge in the wall has been practiced at all times, owing to the greater readiness with which it dresses along the bed than across it. The stratified or schistose rocks as a result of the lamination are often weaker on edge than upon bed. The lamination increases the facility of dressing the stone along the bed, whereby the cost of workings materially lessened. The greatest tendency to lay stone on edge is encountered in veneer work. It is seldom met with in heavy masonry.

"It has been shown that parting planes ordinarily furnish the easiest paths for percolating waters. If these planes are perpendicular to the surface of the earth, they will admit the passage of water much more readily than if they are horizontal. Thus if a block of stone is placed on edge in a wall, there will be greater danger from the freezing of the included water and from the superincumbent pressure, than if it were laid on the bed. In case the stone is laid on edge, the pressure required to split off a lamina

will, ordinarily, be much less than if the stone is laid on the bed. In the former case, the force occasioned by the freezing of the water, which collects between the layers, is augmented by the superincumbent pressure of the wall. Where the stone is laid on the bed, the water is less apt to penetrate along the parting planes, and even though it should circulate equally freely in this position, the superincumbent pressure of the wall would tend to force the expansion in directions parallel to the bedding.

"Furthermore, when the stone is laid on edge the differences in texture of the various laminae are much more strikingly emphasized than where the stone is laid on the bed. This method of laying produces a difference in the rate of weathering of the different blocks as a whole, instead of the minor inequalities of weathering ordinarily shown by the different laminae, when the block is laid on the bed. In any case, weathering results in intensifying the stratification planes.

"One ought to scrupulously avoid laying any stone which shows stratification or schistosity, on edge, in important structures, for the reason, that in this position it is inherently weaker and permits a more ready absorption of water, with the attendant dangers from alternate freezing and thawing. So persistent has been this evil of laying stone on edge, in all parts of the country, that a man who has stone which he desires to place upon the market, but which shows a tendency to scale in old buildings, likes to take refuge in saying that 'that particular stone which shows exfoliation must have been laid on edge.' 'If it has been properly laid,' he says, 'the stone would have been in a perfect state of preservation to-day.' Thus it is sometimes a difficult matter for an architect, who has only a knowledge of a stone from the appearance of buildings already constructed, to tell whether scaling has been due to the inherent weakness of the stone, or to improper methods of laying."

So much we have taken from Prof. Buckley's eminently practical report. His observations on coloring and decay in stone are of the utmost importance to quarrymen and builders everywhere. The lessons that he teaches cannot be enforced too often. Prof. Buckley's excellent report concerning "Means for Determining the Value of Stone for Building or Other Economic Purposes," and also his reports on the building stone deposits of Wisconsin will be given in a later number of this magazine. The final portion of the series will be devoted to an account of the individual quarries of the State.



THE CHAMPLAIN MARBLES.



MONG the leading marble producing firms of the country, both in the richness and variety of its products, is the Barney Marble Company, of Swanton, Vt. They are quarriers and furnishers of the famous Champlain marbles and the sole producers of the Vermont Verde Antique marble. These have met with the very highest favor for interior finish and decorative work and are to be found in many of the finest buildings throughout the United States. They have an unusual richness of color and are unsurpassed for wearing qualities. All of them are free from defects and take a very high finish.

The varieties of marbles produced by the Barney Company merit more than a passing mention. What is called the "Lyonnaise" marble has a background of a deep Pompeian red very evenly mottled with white. The white does not run in veins and streaks, but is so distributed as to produce the richest effects. The "Oriental" marble introduces a new element of color. Some of the reds are a trifle lighter in tint and running all through, occasionally shading into the reds, is a dark gray with almost a tint of blue. The "Jasper" marble is one of the beautiful mosaics, the groundwork being Pompeian red with little blocks of light red and pure white scattered all through it. One of the most beautiful of all the varieties is the "Olive" marble. This is a beautifully harmonious combination of faint red, white, and true olive.

These four varieties can be furnished in any amount and size desired, but a rare and unique variety which can be had in comparatively limited quantities only is the true Pompeian red. This is the only known deposit of a solid red marble. As may be imagined, a slab of it has a very warm and rich effect. All of these marbles are obtained from the quarries of the Barney Company at Swanton, Vt., and are the so-called Champlain marbles. The Vermont Verde Antique is quarried at Roxbury, Vt., where the company owns a large deposit and has a finely developed quarry. This is the true Verde Antique, the name being frequently misapplied to various kinds of serpentine as well as to greenish-yellow marbles. The body is a deep luscious moss green shading into black and beautifully veined with white. "Swanton Black" is quarried on Isle La Motte, an island about twenty miles from Swanton, and is brought to the door of the company's mills at Swanton by boat. It is not a dull, lifeless black, resembling cannel coal, like so many of the black marbles, but shows mottling and veining while holding to a uniform tint.

The Swanton marbles are used mainly for interior finish, such as wainscoting, steps, risers, floors, columns, mantels, urinal stalls, plumbers' slabs, etc., etc. There is scarcely a Government building in the country that has not used a large quantity of the Barney Company's products, and the New York Life Insurance Company has used large quantities in its many build-

ings all over the country. The famous new Northern Hotel, in Chicago, is filled with these marbles, as well as the Illinois Central Depot, and public and private buildings from Bangor, Me., to San Francisco, and St. Paul and Minneapolis on the north to New Orleans on the south. The stone is not absorbent and will not stain. When used for floors or stairways, aside from its increasing beauty from attrition, its hardness makes it practically indestructible. This extreme hardness, together with the soundness of the stone, enables it to take a finish or gloss that is as enduring as the marble itself.

LIMESTONES AND MARBLES OF ALABAMA.

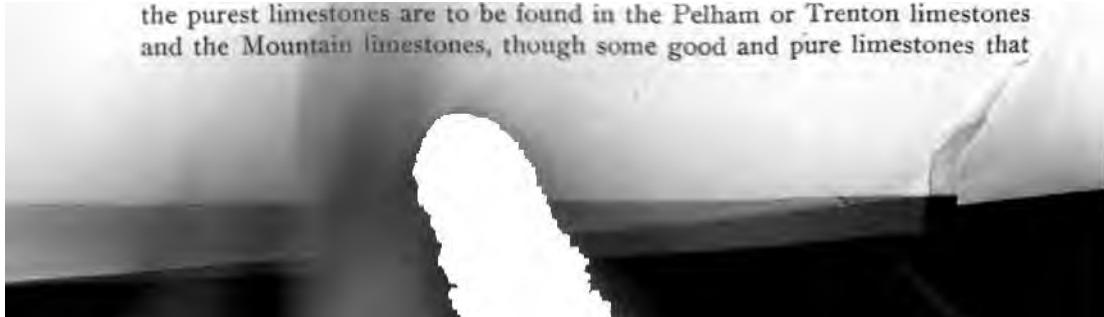
ONE of the most striking features that has been noticed in the industrial development of the South has been the progress made by Alabama in many lines. The great industries that have centered about Birmingham, Anniston and Gadsden have attracted the attention of all throughout this country and Europe. The non-metallic mineral resources of the State, however, have not been generally written about. That there is great wealth in this line waiting to be developed is known to all who have studied the geological conditions of Alabama. Quarrying work has been carried on successfully in a few localities and it is likely that the stone industry will be pushed rapidly within the next few years. The State is fortunate in having an enterprising and active Board of Geological Survey, connected with the University of Alabama, and under the competent direction of Eugene Allen Smith, Ph.D. The board has issued a number of excellent reports covering the different sections of the State and taking up the economic as well as the merely scientific aspects of geology. Some of the recent volumes, namely those by Henry McCalley, the Assistant State Geologist, have given quite a little attention to the limestone formation of the State. This is found in a number of the counties and has been worked profitably and well in some instances. The first of Mr. McCalley's reports deals with the Tennessee Valley region, which embraces all of Alabama drained by the Tennessee River and its tributaries, and the southwestern end of that small portion of the Brown and Blountsville Valley that is drained into the Warrior River. The Bangor limestone of the Tennessee Valley region is of soft or valley making strata, although its outcrops are confined almost exclusively to steep mountain sides. This is because the strata of these mountain sides have a protecting capping of hard weather-resisting rocks. It does not form much agricultural areas outside of the Russellville and Moulton Valley and Jackson County. It may be said to form the whole of the upper sub-carboniferous formation in the northeast part of this region or in Jackson County. To the north of the Tennessee River, it is confined almost exclusively to the east of the Huntsville meridian and to the south of that river to the south of the Little Mountain and its extension eastward. It forms also the steep mountain rims, under the capping bluffs, of the Brown and Blountsville Valley. It thus covers about 1,000 square miles of this region.

and is from 200 to 450 feet thick. Its average thickness is about 375 feet. It is made up of limestones and shales. The limestones are of blue and gray colors. They are mostly massive and pure. They are used extensively for lime burning and fluxing and architectural purposes. The limestones of this group are very fossiliferous, with small crinoidal stems and with pentremites, archimedes, etc. The bottom strata, thin-bedded limestones and calcareous shales, form some extensive tracts of black marshy prairie lands in the Russellville and Moulton Valley. The shales are calcareous. They are sometimes argillaceous and sometimes arenaceous. Some of them in places are variegated, or of red and green colors. These limestones and shales often form naked glady places with clumps of red cedar. This cedar in places is of fine growth, of two feet and more in diameter. It, especially that of Jackson and Franklin counties, has been used for a great many years for telegraph poles, cross ties, fence posts, hollow ware, etc., and for the last few years for the manufacture of lead pencils. The other large growth over these rocks is of white oak, ash, hickory, poplar, chestnut, oak, beech, walnut, etc. The soil, a stiff, black and mulatto waxy soil, is very calcareous. It is especially good for grain and grasses.

This group has in it also some very large sinks, caves and big limestone springs. Some of the caves contain extensive deposits of niter earth and bat guano. The limestone strata that are full of crinoidal stems are usually very good coarse oil sands. Some of them are so bituminous as to be black with maltha (semi-liquid bitumen), to blaze up when thrown into a hot fire, and when freshly broken to emit a disagreeable smell of petroleum and sometimes to even show drops of petroleum. They can be easily made to yield petroleum on distillation. They are the source of maltha or mineral tar springs. This maltha or mineral tar occurs in all of the seams and pores of the rocks. It hardens or becomes asphaltum on exposure or oxidation and shows on the outcrops as black tarry streaks on the rocks.

Marbles or hard, durable limestones that will take a good polish are to be found in the Silurian and sub-carboniferous formations of this region. The best of them, perhaps, are the white and variegated marbles of the Upper Silurian formation (Niagara Group) near the State line on Shoal Creek, Lauderdale County. Some of these rocks are dull colored magnesium marbles. The white and variegated crinoidal limestones in Lauderdale and Colbert counties, of the Lauderdale or Keokuk Chert Group, however, are often quite beautiful marbles. The upper sub-carboniferous formation also carries strata that take a very good polish, as the crinoidal limestone at the bottom of the formation near Trinity, and the oolitic limestone, near the top of the formation, that is being quarried and worked at Rockwood.

Good building stones occur in nearly all of the formations and are to be had for the mere quarrying in nearly all parts of this region. They are of both limestone and sandstones, and, as a general thing, are soft enough when first quarried to be easily cut and sawed. They, however, harden on exposure and are durable rocks. The best limestone for this purpose and the purest limestones are to be found in the Pelham or Trenton limestones and the Mountain limestones, though some good and pure limestones that



are beautiful and durable building stones are to be found in others of the limestone. They have been quarried near Dixon, Trinity, and other places along the M. & O. R. R. at Rockwood on the E. S. & T. River R. R. etc. At the last named place the E. S. & T. Limestone Company has the largest and best equipped building stone outfit, so it is said, north of the Ohio River. They have three dimension quarries with steam drills, rock and chain breaking machines, and two large mills for sawing stone, each containing eight garage or saws, of the most modern and approved pattern.

The limestone quarried and worked at the Limestone Quarries at Rockwood near the foot of Sand Mountain is a fine uniform gray and homogeneous light gray color, about 27 feet thick. It is hard and durable, though somewhat rough when first quarried to be cut or planed to any design required. It has but very few scars or fissures. It is quarried by the use of steam quarrying machinery which cut deep channels in the solid rock. Steam drills and wedges are also used. Blocks are quarried here weighing 25 tons without a crack or flaw. The size of such blocks are limited only by the capacity of the hoisting machinery. There are here five quarries, two dimension and three for building stones, and two stone sawmills. The quarries are some two miles west of Harrington on the E. S. & T. River R. R. They are connected to the main line by a private branch railroad.

There are flags of both sandstones and limestones that are well suited for paving and curbing purposes in many parts of this region. These flags vary in thickness from a few inches to 18 inches and have often smooth or faintly rippled marked sides. The best or most regular of them are perhaps of the Coal Measures. Some hard thick flags of limestoneaceous limestones are quarried in several places on the M. & O. R. R. cut up into square paving blocks and shipped to Memphis.

The second report by Mr. McCalley deals with the Coosa Valley region which embraces most of the counties in Alabama with Appalachian characteristics, or all of the Paleozoic strata that are drained by the Coosa and Cahaba rivers, and the most south eastern of those that are drained by the Warrior River. Mr. McCalley says: Marbles or hard durable limestones and dolomites that will take a good polish are found in many parts of this region in all the limestone and dolomite formations. The main deposits of true marbles, or of crystalline limestones and dolomites are to be found, however, in the southwest portion of the region in the older less metamorphosed strata, the truest or most crystalline marbles being along the great Talladega Thrust Fault that divides this region from the crystalline strata. The best and largest deposits are in Talladega County. They are of the Coosa, Talladega shale and siliceous, Knox dolomite and chert formations. Farther to the southwest, however, in Bibb, Shelby, Calhoun, Jefferson, etc., counties, there are some very good marbles in the Pelham, Cretaceous, limestone, and in the Tuscarora shale and sandstone formations. Many of these rocks are variegated and beautiful after being polished. Those of Talladega County are of white, bluish and dark colors. They take an exquisite polish and have been worked to a considerable extent in eight to ten different quarries, though they are not worked at all now. Those of one quarry, beautiful crystalline rocks, have also been used as a flux in an

iron furnace. Those farther to the northwest, of the Pelham (Trenton) limestones, along the Cahaba River, in Bibb County, have also been worked.

These rocks of good quality and convenient thicknesses can be had in abundance in nearly all parts of this region. They are usually soft enough on being quarried to be easily cut or sawed, but they harden on exposure.

These stones are both sandstones and limestones. The sandstones have been quarried in Tuscaloosa, Jefferson, Etowah, Calhoun, Talladega, Saint Clair, etc., counties. Those of the Coal Measures were used in building the locks in the Warrior River, those of the Oxmoor shales and sandstones in the bridge piers over the Coosa River at Gadsden, those of the Red Mountain formation in many of the Birmingham structures, and those of the Weisner formation, often variegated, in many of the handsome buildings around Anniston, etc. The native sandstones are used in all sections of this region for foundations, chimneys, culverts, fence walls, etc. The best and most of the sandstones used in building the locks at Tuscaloosa were taken out of the bed of the river in blasting out the channel. The limestones are used for all kinds of building purposes. They were used in building the locks along the Coosa River below Greensport, and the piers of the railroad bridge over the Coosa River at Riverside, etc., etc. They have been quarried in Bibb, Shelby, Jefferson, Saint Clair, Talladega, Calhoun, DeKalb, etc., counties. The quarries are in several formations, though the most important of them are in Pelham limestones.

Paving and curbing stones of very uniform thickness with smooth and beautifully ripple-marked sides abound in numerous localities in the Coal Measures and Red Mountain formations of this region. They can be had of almost any thickness, length and width. They are so uniform in some of the bluffs and outcrops that they have received the name in certain localities of plank rocks. They have been used in Birmingham for paving and curbing purposes and in a great many localities for building chimneys and for head and foot stones and coverings for graves.

Millstones of very good quality can be made in many places out of the conglomerates of the Weisner formation, Coal Measures and Lafayette formation of this region. They are being made in several places out of the hard conglomerates near the base of the Coal Measures and out of the ferruginous conglomerates of the Lafayette formation. The millstones from these rocks have good local reputations. It is believed, however, that the quartzitic conglomerates of the Weisner formation is in places a still better rock for this purpose.

Many of the fine grained, compact dolomites of the siliceous (Knox), dolomite and chert formation look as if they might make very good lithographic stones. They are of grayish and yellowish gray colors. They have a conchoidal fracture and are homogeneous throughout. Of a sample from Talladega County that was doubtless of this formation, Dr. George P. Merrill, Curator of Geology in the United States National Museum, says: "The Alabama stone examined by the writer is finely granular and too friable for satisfactory work. Qualitative tests showed it to be a siliceous magnesian limestone. It is, of course, possible that the single sample shown does not fairly represent the product." It is hoped that the above sample

was not as good as an average sample of the lithographic looking rocks of this formation. Other formations, as the Pelham (Trenton) limestones and the Bangor limestones, have in places strata of compact homogeneous argillaceous looking limestones that might make lithographic stones. Still it is impossible to tell from mere looks or from even chemical analyses whether a rock will make a good lithographic stone or not, an actual practical test being the only thing that can be relied on.

These rocks or limestones and dolomites of pure quality occur in abundance in nearly all parts of this region. They sometimes are very pure or have less than one per cent. of silica and only traces of iron and alumina. They are to be found in the Bangor limestones, Pelham (Trenton) limestones, and siliceous (Knox), dolomite and Chert formations. Those of the Bangor limestone, or its contemporaneous type, Oxmoor shale and sandstone formation, are scarce in the southeast part of the region. Limestones and dolomites, when pure, are suitable for and are used for a great many purposes, but those of this region are used much more for lime burning and fluxing, than for all other purposes combined. The quarrying of lime burning and fluxing stocks constitutes one of the great industries of this region.

The lime burning rocks of this region, so far as known, are confined to the limestones, though not because the dolomites will not make a good quality of quicklime. The limestones used are of the Pelham (Trenton) limestones, which makes a "fat" lime, though the purer limestones of the other formations would make perhaps about just as good a quicklime. The principal quarries and kilns of this region for the lime burning rocks are in Shelby, Etowah and Calhoun counties.

The fluxing rocks were also exclusively limestones up to a few years ago, but now they are in a great measure made up of a mixture of limestones and dolomites. The dolomite flux is found to be much the better for the making of the new product, low silicon pig iron, of some of the furnaces of this region. It is purer than the limestone flux, as it has an average of only about 1.50 per cent. of silica, while the limestones used as flux will average about 4.00 per cent. silica. The principal quarries of this region for fluxing limestone are in Jefferson, Blount, Etowah, Shelby, Talladega, Calhoun and Cherokee counties. They are in the Bangor limestone and Pelham (Trenton) limestone formations. The fluxing dolomite is mined now only in Jefferson County, though it has been mined to a slight extent in Talladega and Calhoun counties. This use of limestones and dolomites, to keep up with the iron industry, has grown very rapidly, until it now consumes most of the limestones and nearly all of the dolomites quarried in this region.

THE USE OF MARBLE VENEERS.

SEVERAL months ago STONE reprinted an article from an English magazine expressing surprise at the extensive use made of marble in American architecture. The present method of construction in this country, especially of business buildings and fine residences, takes for granted the use of marble for interior decoration. It has been approved by the best architectural authority and the results obtained have been more than satisfactory from every point of view. But in England there is still a discussion, mainly from an academical standpoint, as to the advisability of employing marble for this purpose. A recent number of the "Stonemason," published at Bristol, England, says:

Some exception has been taken to the use of marble cut in slabs and used as a veneer for brick or stone walls. It has been urged that this method is likely to be destructive of good architecture, because of the danger that it will end in the entire concealment of the real construction of the work; but this argument is based on the assumption that the veneering of a wall with marble slabs must necessarily imitate construction. It is true that we sometimes see the walls of a room lined with small rectangular slabs of marble, carefully arranged, so as to break joint on the face, and sometimes with joints solid at the rises, instead of being allowed to show as quirks, or rebates, when in short every effort is made to deceive the observer into the belief that the walls are constructed of solid blocks of marble. In such cases, the whole system of decoration may be deservedly denounced as a piece of false work, quite as objectionable as the marble block wall papers which we occasionally see.

But in the right use of marble veneer there need be no attempt to deceive the eye. With the use of slabs too large to be mistaken for solid blocks; and with the long vertical joints necessitated in paneling with variously-colored marbles, we follow a treatment distinctly unconstructional. When we have a marble with any decidedly marked pattern in it, we can saw it into thin slabs; and by reversing these and placing them in juxtaposition, we can obtain very beautiful effects in a perfectly legitimate manner. A panel of this kind tells its own tale at once. The sections composing it cannot consist of entirely separate blocks, and they are put together without any attempt to break joint.

In veneering brick walls with marble, the slabs used are rarely less than $\frac{3}{4}$ -in. thickness, although the Romans are said to have veneered the walls in the baths of Caracalla with slabs of only $\frac{1}{4}$ -in. thickness. It is usual to leave a clear space of $\frac{3}{4}$ -in. between the marble and the wall to include the plaster backing, and any slight irregularities in the wall surface. Polished marble suffers from the disintegrating influence of damp, so that the slabs should not be fixed until the walls are fairly dry. If there is any doubt about the walls being dry, it is best to leave open joints in the marble work for some time, so

as to admit of a free circulation of air behind and prevent condensation.

It is best to leave open space where possible between the marble and the wall, and with this object it is better for the backing to be laid in narrow vertical strips, so placed that each slab may rest against at least two of them. The best fixing is obtained when a slab can be inserted between two projecting string courses of solid marble built into the wall. Grooves or rebates may be cut in the upper and under side of the string course to receive the slabs, and the groove receiving the upper edge of each slab, to allow sufficient "play," so that the slabs may not be crushed or injured in the event of a settlement of the wall behind.

It will be understood that extremely careful workmanship is necessary in fixing marble linings, so as to avoid injuring the edges of the slabs; great care is requisite in cutting them to the proper size, and in setting out the work before it is fixed. The hooks and staples used in fixing should be of copper or gun-metal, and so arranged as to afford a support for the slabs, and so prevent them from being subjected to any undue pressure. Beads and ovolos are frequently worked upon the arises, or else the slabs are finished square at the edges, so as to make a simple arise, no attempt being made to deceive the eye by an invisible angle joint. The angles are usually strengthened by means of gusset-shaped blocks of freestone or terra cotta, fixed inside with plaster or cement.

THE BIRTH OF THE SCIENCE OF GEOLOGY.

THE eminent English scientist, Sir Michael Foster, in his recent presidential address before the British Association, dwelt on the fact that some of the most fruitful advances made in chemistry, geology and electricity were made at the very close of the eighteenth century, and that the concrete achievements of the present are the translation into fact of the purely intellectual efforts of Lavoisier and Priestly, of Galvani and Volta, of Hutton and of Cuvier. With regard to electricity he said: "If there be one word of science which is writ large on the life of the present time, it is the word 'electricity'; it is, I take it, writ larger than any other word. The knowledge which it denotes has carried its practical results far and wide into our daily life, while the theoretical conceptions which it signifies pierce deep into the nature of things. We are to-day proud, and justly proud, both of the material triumphs and of the intellectual gains which it has brought us, and we are full of even larger hopes of it in the future. At what time did this bright child of the nineteenth century have its birth? He who listened to the small group of philosophers of Dover, who in 1799 might have discoursed of natural knowledge, would perhaps have heard much of electric machines, of electric sparks, of the electric fluid, and even of positive and negative electricity; for frictional electricity had long been known and even carefully studied. Probably one or more of the group, dwelling on the observations which Galvani, an Italian, had made known some twenty years before,

developed views on the connection of electricity with the phenomena of human bodies. Possibly one of them was exciting the rest by telling how he had just heard that a professor at Pavia, one Volta, had discovered that electricity could be produced not only by rubbing together particular bodies, but by the simple contact of two metals, and had thereby explained Galvani's remarkable results. For, indeed, as we shall hear from Professor Fleming, it was in that very year, 1799, that electricity as we now know it took its birth. It was then that Volta brought to light the apparently simple truths out of which so much has sprung. The world, it is true, had to wait for yet some twenty years before both the practical and the theoretic worth of Volta's discovery became truly pregnant, under the fertilizing influence of another discovery. The loadstone and magnetic virtues had, like the electrifying power of rubbed amber, long been an old story. But, save for the compass, not much had come from it. And even Volta's discovery might have long remained relatively barren had it been left to itself. When, however, in 1819, Oersted made known his remarkable observations on the relations of electricity to magnetism, he made the contact needed for the flow of a new current of ideas. And it is, perhaps, not too much to say that those ideas, developing during the years of the rest of the century with an ever-accelerating swiftness, have wholly changed man's material relations to the circumstances of life, and at the same time carried him far in his knowledge of the nature of things."

Referring to geology, Sir Michael remarked: "Of all the various branches of science, none, perhaps, is to-day, none for these many years past has been, so well known to, if not understood by, most people as that of geology. Its practical lessons have brought wealth to many; its fairy tales have brought delight to more; and round it hovers the charm of danger, for the conclusions to which it leads touch on the nature of man's beginning. In 1799 the science of geology, as we now know it, was struggling into birth. There had been from of old cosmogonies, theories as how the world had taken shape out of primeval chaos. In that fresh spirit which marked the zealous search after natural knowledge pursued in the middle and latter part of the seventeenth century, the brilliant Stenson, in Italy, and Hooke, in our own country, had laid hold of some of the problems presented by fossil remains, and Woodward, with others, had labored in the same field. In the eighteenth century, especially in its latter half, men's minds were busy about the physical agencies determining or modifying the features of the earth's crust; water and fire, subsidence from a primeval ocean and transformation by outbursts of the central heat, Neptune and Pluto, were being appealed to, by Werner on the one hand, and by Desmarest on the other, in explanation of the earth's phenomena. The way was being prepared, theories and views were abundant, and many sound observations had been made; and yet the science of geology, properly so called, the exact and proved knowledge of the successive phases of the world's life, may be said to date from the closing years of the eighteenth century. In 1783 James Hutton put forward in a brief memoir his 'Theory of the Earth,' which in 1795, two years before his death, he expanded into a book; but his ideas failed to lay hold of men's minds until the century had passed

away, when, in 1802, they found an able expositor in John Playfair. The very same year that Hutton published his theory, Cuvier came to Paris and almost forthwith began, with Brongniart, his immortal researches into the fossils of Paris and its neighborhood. And four years later, in the year 1799 itself, William Smith's tabular list of strata and fossils saw the light. It is, I believe, not too much to say that out of these geology, as we now know it, sprang. It was thus in the closing years of the eighteenth century that was begun the work which the nineteenth century has carried forward to such great results. But at that time only the select few had grasped the truth, and even they only the beginning of it. Outside a narrow circle the thoughts, even of the educated, about the history of the globe were bounded by the story of the deluge—though the story was often told in a strange fashion or were guided by fantastic views of the plastic forces of a sportive nature.

WATERWORKS AND SEWAGE IN TAMPICO.



TAMPICO, on the Gulf of Mexico, at the mouth of the Panuco River, is comparatively a new city. It is now a deep-water port, and vessels drawing 24 feet steam up to the wharves. It is a railroad center, being a terminus of the Mexican Central Railroad and of the Monterey & Gulf Railroad. A bill has been approved by the State legislature for construction of waterworks, drainage and street paving. An estimate of the value of the work to be done is about \$800,000 silver. The payment for the proposed improvements will be guaranteed by the State. Translation of the advertisement for bids reads:

The city council of Tampico, being authorized by the legislature of the State in a bill passed on the 29th of June last, to solicit bids for the construction of waterworks to furnish 8,000 liters of portable water per minute for the individual and public use of the city, as also for a complete system of sewerage, including in this list the paving of the street on the macadam plan or any other good system, did, in open session to-day, resolve to invite all persons, companies or enterprises in the Republic or out of the Republic, considered able to execute one or both of the proposed improvements, to present to this council their proposition under sealed cover on or before the 15th of February, 1900, leaving each bidder to formulate the propositions by contract at a fixed price, or as stipulated by the concession, the conditions to be expressed clearly in the proposition, and whether for one or both of the improvements. The following are the conditions to be noted:

First.—The water must be taken from the Tamesi River at a distance of about 20 kilometers (12.42 miles) from the city, and may be brought by gravitation in vitrified pipe to a point approximately some 10 kilometers (6.21 miles) from the starting point, and an equal distance from the city. The water must be filtered before reaching the city.

Second.—At the intermediate point, denominated Tancol, the machinery and necessary pumps can be located to raise the water to the height of Fort Liberty, which is an elevation of about 39 meters (128 feet) and distant

some 9 kilometers from Tancol and approximately 1 kilometer (0.623 of a mile) from the city, which elevation will be sufficient to distribute the water in subterranean pipes throughout the city by gravitation.

Third.—At Fort Liberty, an ample reservoir of masonry must be constructed to hold sufficient water so that the supply of the city may not suffer interruption for any cause.

Fourth.—The network of tubing necessary for the distribution of the water throughout the city will approximate a length of from 9,000 to 11,000 meters (27,861 to 36,089 feet).

Fifth.—The party or parties whose plans and estimates are approved must guarantee the fulfilment of the stipulations by a deposit of \$5,000, which will be held by the State treasurer.

Sixth.—The contract or contracts awarded must be made before a notary public, having been first approved by the State legislature, all the expenses for such documents being borne by the contractor or contractors.

Seventh.—All information that interested parties may need will be furnished by the city clerk.

Eighth.—All propositions must be presented to the mayor of the city on or before the 15th of February next, accompanied by the plans and necessary details.

Ninth.—If a proposition is made to the city council by an individual, company, or enterprise, residing outside of the city, some one domiciled in the city and with sufficient power to contract, must act as a representative of such person or organization.

NEILL E. PRESSLY.

Tampico, Aug. 12, 1899.

Vice-Consul.

THE MATERIAL FOR THE PERMANENT DEWEY ARCH.

RUSSELL STURGIS, the eminent art critic, has written a series of articles for "The New York Evening Post" on the Dewey arch. Mr. Sturgis has considered the work in its entirety as an architectural and artistic creation, and has also given a detailed and critical account of the individual statues and groups. In his final article he writes of the reproduction of the arch in permanent form, and discusses the material of which it should be constructed. Mr. Sturgis says:

Coming now to the question of the proper building of the structure, one is reminded at the very outset of the great difficulty concerning the material. What is the best material for sculpture which is to be exposed not merely out-of-doors, in the open air, but unsheltered from rain and snow? White marble, if it would hold its own, keep its perfect form, and remain white, would not find much opposition. White marble laid up in a wall and forming friezes, panels, or the like, is apt to turn pleasantly yellow, or dusky brown, or even to a not inharmonious gray; all in accordance with the quality of the material from the individual quarry; but this is partly because of the protection which it receives from the different parts of the structure itself. All of us who have become accustomed to the marble statuary so abundant in the

cities of Europe must have recollections of this and that favorite group which is marred to our recollection by the great blotches of black or of dust-colored stain which weathering and dust have added to the system of light and shade proposed by the sculptor. Certainly a great splash or blotch of a dirty gray upon shoulder, arm and breast is not that addition to the chiaroscuro which the creator or the admirers of a work of art would choose. Where there is a large group, these blotches of compacted and hardened mud passing gradually into permanent stain of the material are more disfiguring. They tear the design of the group to pieces, in a singularly offensive way. The exhalations of the canals or some other influence in Venice have stained the marbles of that city with large patches of singular blackness, which do not wholly destroy the value of an architectural detail, but which are nearly fatal to marble statuary which has been placed out-of-doors. If, therefore, marble retains its form and hardness, it is still of doubtful fitness as a material for such sculpture as that which the present temporary arch has, and such sculpture as we all hope to see included in a lasting structure.

But will statuary of marble retain its form and will marble upon which moisture falls or lies long preserve its hardness in our climate? Has it ever been the fate of marble statuary to endure a climate so trying? Has marble, when worked into the delicate parts of figure sculpture in groups been called upon ever to resist such changes in temperature and such sudden falls of temperature following rain or snow as New York sees every year? These questions must be answered by the commission upon whom may come the responsibility of choosing the material for the future building; and with those questions they will need to answer, also, those which relate to a choice among the different marbles known, and their comparative value; and the value also of white or very light gray stone which can hardly be called marble—such as the Roman travertine or that Istrian stone which is so well known to us all by the monuments of Venice. The question as to protection of the material against the absorption of water, and therefore against what we call roughly the effects of the weather—the protection of the stone by applications of dressing which may render the surface water-tight without changing its appearance, will also need much consideration for their proper answer. If the surface, even of a soft stone, can be rendered non-absorbent, then that stone may last for centuries.

The plaster arch having impressed every one so favorably, the spectator's mind at once imagines the future arch to be a white thing; but what if this were not found to be altogether best? What if the colors of the neighboring monument, that erected long ago to Admiral Farragut, be not equally agreeable in a building for permanent preservation? In that work the rich and elaborate pedestal, with its exedra, is composed entirely of North River bluestone; that is to say, the singularly hard, compact, and enduring sandstone which is quarried out of the foothills of the Catskill Mountains. This stone, when of select quality, is admirable in color and retains that color almost perfectly, as an observation of the Farragut base will show. Sculpture in relief can be rendered in that material with faultless perfection, and the effect of such relief in the dusky material is exquisite. Whether or no the sculptor would model his work with a somewhat different touch—with a somewhat

different sense of the fitness of surfaces to convex curves and hollows—when working towards a final composition so dark in color, is indifferent. It must be remembered that the sculptor works out his first imaginations and finishes his full-size group or bas-relief, all in dark brown wet clay; and that, although by long habit he expects to see this clay model cast in white plaster very shortly, there is nothing to prevent him from having that casting done in a dark-colored plaster, so that he will never, from the beginning of his work to its end, see it in a snow-white medium. The instinctive feeling of each sculptor may be trusted for this; nor need the public be terrified lest any interference with the artist's free hand and free mind come by the choice of a material like bluestone.

There is, however, another consideration. The main advantage in employing so dark a material would be the admirable background which the building proper would then furnish to statuary in bronze. Bronze statues relieved upon a white marble ground are unfortunate in this—that they tell immediately as dark silhouettes against the brilliant white, and that the minute perfections of their modeling are lost, except for those who will take great pains to eliminate the effect of the white material around and to see the bronze by itself. If the sculptor of a group in bronze were to be asked his opinion about the best setting-off and backing up of his work, it would not be a wall of white marble which he would select, no matter how much its surface might be broken up or how the whiteness might seem to be diminished by the tooling which it had undergone. If we can imagine, then, all the figures of Ward's great group to be of bronze and of the general color, which now, in October, 1899, invests French's O'Reilly monument in Boston, or Ward's Thomas monument in Washington, or St. Gaudens' Lincoln in Chicago, or any one of the bronze groups in New York—let us go further and imagine the group to be standing upon a great table of dark bluestone. Proceeding downward, the reader may imagine the eight colossal portrait statues or their equivalent to be in bronze, with a bluestone attic behind them, and below this he has to imagine the four great groups fronting the piers to be also of bronze, and, if he chooses, the capitals of the columns also, though whether these are so or not will depend absolutely upon the question of the best disposition of the cool, dark shades, bronze and bluestone, in what would be, after all, a polychromatic study. The great reliefs in the spandrels and those flatter reliefs of the two ends above the smaller archway, as well as the medallion portraits, may all be imagined as cut in the bluestone itself; and so may be the lettering of the attic. Here, again, however, both as to relief sculpture and as to less high relief, the committee of design and decision will apportion the surface between the two materials according to the color scheme which they might decide upon after seeing many experiments tried on a small scale, or many tentative colored drawings. The whole building will be dark in color, but the scheme of the dusky polychromy is capable of very great modification.

If the effect of bronze with a more strongly contrasting background be not too much feared, one of our red granites may be used. It is known that one of our ablest sculptors thinks favorably of this combination of materials. The granite would not be polished; it would be left from the tool, and this

throughout all the carved and moulded surfaces; so that the whole mass of the building shall be of one tint, with but the slight modifications caused by the surfaces of different blocks, while all the sculpture—or at least all the statuary—will be of the contrasting color of greenish bronze.

If, however, it be admitted that there is a sentiment in favor of a uniformly light-colored building, and that this sentiment is not undeserving of respect and observance, there remains the very interesting question how far the work will be carried out, complete, in one material only, all of one color, and therefore more easy to bring into perfect harmony, if it were made, sculpture and all, of one of our very light-colored and fine-grained granites. Has not the recent experience of the city in some of its newest business buildings and great club-houses been such as to encourage the belief that statuary, as well as architectural decoration, might be executed in granite without serious modification of the sculptor's designs? The architects of the Cathedral of St. John the Divine have chosen a granite for their exterior, and this not without much thought, much care, minute experiment and deliberate weighing of all the advantages of all accessible materials. If it be true that statuary in full realization be no part of their design for the exterior of the cathedral, it is also true that granites of lighter tint than the one chosen by them are perfectly available. Indeed, there is in Central Park a statue of light granite which visitors take for marble as they see it across the grass fifty feet away. Suppose that the stone for the arch, including the groups of sculpture, be all selected from among the blocks afforded by some large granite quarry during two or three years of its output; suppose that the quarry be controlled entirely by the commission in charge of the arch, so that full freedom of choice may be had; would it not be quite within the range of possibility that the material, finely and carefully worked, though, of course, not polished in the usual sense of the word, would afford an excellent color and an excellent surface? Is it not probable that one of the pleasant, cool grays, approaching white, to be sure, but not in any proper sense of the word actually white, would gratify us all, sculptors, critical students and admiring public alike?

We must not lose sight of the fact that we have no models to guide us—no models and guides as to what to adopt—though plenty to tell us what to avoid—for there is no structure now existing in modern perfectness, nor known to us by its ruins and by our conception of its former perfect state, which can in any way afford us an example to follow. How far the Roman memorial arches were treated with brilliant color effects by means of paintings, with sculpture on the friezes and with panels adorned by members of gilded bronze; and with the crowning group entirely of the same brilliant metallic surface, while the stonework of the arch below was either entirely or in large part painted in vivid descriptive or "local" color—how far any single Roman arch is to be conceived by us as designed in such a chromatic scheme as that we have no certain knowledge. All we know about it is that public money and the money contributed by liberal citizens must not now be spent in experiments of that sort. Some rich man will be found to try these experiments for us, and to build at his own cost, and because he enjoys the attempted solution of the problem, buildings vividly painted and gilded in the pure Greek or in the more elaborate Roman manner; but that is not the

question here. The interesting thing is that we must work the problem out from the beginning, and that the public must have to serve it a commission which will exhaust the range of possibilities, and meet and try all suggested solutions of the problem before the work rises above the level of the ground.

The very matter of bronze, assumed to be the best thing for statuary, other considerations permitting of it, the very matter of that material itself, cast metal, is a difficult one. Our common alloy which goes by the name of bronze gives a fine patina, either as exposed to the weather or as treated chemically before it is put into place, indoors or out. But how is it with the bronze which is exposed to the dust of our thoroughfares, lighting upon all bearing surfaces—lying there till rain or snow comes to compact it, and thereafter caked in thick paste upon the backs of horses, the tops of heads and hats, and in the hollow of shields and garments? Every fresh rain which falls upon this composition leads fresh streams of dirty water trickling down the sides, and this, acting upon the as yet uncompleted patina of the bronze, seems to stain the whole surface in the most unseemly manner. There is nothing uglier in the way of mere coloration than the paint-like daubs and splashes which some of our New York monuments show on their finely modeled bronze statuary. Let the reader spend a Sunday afternoon, or, if the monument is uptown, then a Sunday morning, in contemplation of the best of these monuments, and see if he is satisfied with the effect of New York City dust as applied by the aid of the rain to the slowly coloring surface of bronze.

If, therefore, we propose to spend three-quarters of a million in the building of a permanent memorial of the naval victories of 1898, it will not be found sufficient to raise the money to employ sculptors and a directing superintendent of the work, to appoint a committee of artists with absolute power, to encourage the designers of the most successful pieces of sculpture now before us in plaster to do their best and give their fullest thought to the perfecting of their work. It will be necessary also to use materials or a material which will allow the work to have its utmost possible effect, in the first place, and to retain its beauty as long as our civilization lasts. We cannot put it into diorite or basalt, because to adopt such materials as those, however familiar they were to the stonecutters of six thousand years ago, would be to hamper every part of the artistic undertaking; but we may use still more permanent metal, or granite almost as enduring, or, perhaps, modern science may teach us how to make white marble, with its crystalline beauty, or white or light gray limestone with its greater uniformity and less oppressive glitter, so completely waterproof that frost will be no longer dangerous. Nothing which will ever require future cleaning or repair should be considered sufficiently good for the purpose. Nothing should be put into the permanent structure which will ever require the services of a gang of workmen with scaffolding and cleansing apparatus. Cleansing, even of the most usual and commonplace sort, restores not the beautiful tone of age and wear, but the original gleam of the material or a poor and unsatisfactory approach to it; but this is nothing compared with the danger there is that where a man with a broom has been the man with the chisel or the file will follow. There is always that terrible danger threatening precious works of art, even in national

museums—the danger that they will be restored, cleaned up, made handsome and bright, and as new-looking as at first, to the absolute destruction of their original artistic value. The monument in a public place is even more exposed to this risk, because, although the work of destruction cannot be carried on in secrecy, as in the storerooms of a museum, it will be even more eagerly demanded by the city authorities and the uninstructed public to whose demands they give the most careful heed. Whenever it appears that the enterprise which we are considering is really launched, a committee of artistic and constructional ways and means will be found as immediately necessary as a committee on the ways and means of raising funds.

THE ART OF CUTTING PORPHYRY.

HE art of cutting porphyry practiced by the ancients appears to be now quite lost. Indeed it is difficult to imagine what kind of tools they employed wherewith to fashion those huge columns and other porphyry works in some of the ancient Roman buildings. A tomb of Constantia, daughter of Constantine, is one of these remains, and still entire. It is commonly called the tomb of Bacchus, and is in the Church of St. Agnes. Some ancient pieces seem to have been wrought with the chisel, others with the saw, others with wheels, and others again ground down with emery. Yet modern tools will scarcely touch porphyry. Dr. Lister, therefore, thinks that the ancients must have had some secret for tempering steel, and not as others have advanced that they possessed means of softening the porphyry; though on the other hand it is probable that time and air have contributed to increase its hardness. Addison states he saw a workman at Rome engaged in cutting porphyry; but his advances were extremely slow, in fact, almost insensible. The Italian sculptors work the pieces of old porphyry columns still remaining (for their quarries are long since lost) with a brass saw without teeth. With this saw, emery and water they rub and wear the stone with infinite patience.

Many persons have endeavored to retrieve the ancient art, and particularly Leon Baptista Alberti, who, searching for necessary materials for temper, says he found goat's blood the best of any; but even this availed not much, for in working with chisels tempered therewith sparks of fire were thrown off much more abundantly than pieces of the stone. The sculptors were thus, however, able to make a flat or oval form, but never could attain to anything like a figure. In the year 1555 Cosmo Di Medicis is said to have distilled a water from certain herbs, by help of which his sculptor, Francesco Tadda, gave his tools such an admirable hardness and so fine a temper that he performed some most exquisite works with them.

The French have discovered another mode of cutting porphyry with an iron saw destitute of teeth, "grez" (a kind of freestone pulverized), and water. Others have proposed to harden tools to cut porphyry by steeping them in the juice of the plant called "brankersine," or bear's breech. Boyle says that he

caused porphyry to be cut by means of emery, steel saws and water, and observes that in his time the English were ignorant of the manner of working porphyry, none of them understanding to cut or polish it. Da Costa supposes, and perhaps with reason, that the methods used by the ancients in cutting and engraving porphyry was extremely simple, and that it was performed without the aid of any scientific means since extinct. He imagines that by unwearied diligence and with numbers of common tools they rudely hewed or broke the stone into the intended figures, and by continued application reduced them into more regular designs, that they then completed the work by polishing it with great labor through the aid of particular hard sands found in Egypt, and he thinks that in the porphyry quarries there were layers of grit or loose disunited particles analogous to the porphyry, which they carefully sought for and employed for this purpose.

THE PRODUCTION OF GARNET.



THE garnet industry of the United States has shown a decrease rather than an increase during the past few years. With gem garnets there is always something doing. Mr. George F. Kuntz, the gem expert, contributes the chapter on "Precious Stones," to Part VI. (continued), of the Nineteenth Annual Report of the United States Geological Report, devoted to the mineral resources of 1897. Mr. Kuntz says of the production of almandite garnet during 1897: "During the last year large quantities of a pale almandite garnet, often almost pink, have been found in the Cowee Valley, in western North Carolina. These have been cut and extensively sold as American gems. Mr. Walter Harvey Weed, of the United States Geological Survey, reports the abundant occurrence of almandite garnet at the placers in Post Creek, Montana. Almandite garnet is reported as plentiful between North and Middle Tule rivers, in Tulare County, California, by Mr. L. B. Hawkins. Essonite cinnamon garnet at Three Rivers, Tulare County, California, and pyrope at Rattlesnake Creek, Tulare County, California, have been reported by Mr. M. Braverman."

But the most important use of garnet is as an abrasive material. The chapter devoted to this subject in the Nineteenth Annual Report of the Geological Survey is by Mr. Edward W. Parker, who says: "The localities from which the commercial product of abrasive garnet is obtained are Litchfield County, Connecticut; Essex and Warren counties, New York, and Delaware County, Pennsylvania. The production in 1897 was 2,554 short tons, valued at \$80,853, against 2,686 short tons in 1896, worth \$68,877, a decrease of 132 tons in quantity and an increase of \$11,976 in value. The increase in value in 1897 indicates a slight reaction from the declines shown in the two previous years. In 1894 the average price per ton for abrasive garnet was \$37.76; in 1895 it fell off to \$28.59, and again to \$25.64 in 1896, recovering somewhat to \$31.66, in 1897. The statistics of abrasive garnet production were not collected prior to 1894, since when the output has been as follows:

PRODUCTION OF ABRASIVE GARNET FOR FOUR YEARS.

Year.	Short Tons.	Value.
1894.....	2,401	\$90,660
1895.....	3,325	95,050
1896.....	2,686	68,877
1897.....	2,554	80,853

Later statistics than those contained in the Nineteenth Report show that the production made a slight gain, both in quantity and value, in 1898. The output last year was 2,882 short tons, valued at \$82,930. The resources of the country are practically unlimited, but the demand for the abrasive are not large.

Mr. Verplanck Colvin, Superintendent of the New York State Land Survey, in his last admirable report, describes the large deposits of garnet in Essex County, one of the wildest regions in the Adirondacks. Mr. Colvin says:

"Garnet Peak is the next summit northwesterly from the Black Eagle, or northerly from Crow Mountain, and its steep, gray ledges are very noticeable on the easterly side of the Blue Mountain road at the summit, where the land begins to descend northerly. In this vicinity are several mines of the mineral popularly styled 'pocket garnet,' the pockets being merely large crystals, sometimes quite regular in form, but often in large amorphous masses. In the adjacent part of the Fourteenth township is a mine, and a mill at which the mineral is separated. It is reduced to fine grained particles of various grades and is then used as an abrasive in finishing hard wood, etc."

Of the outcrop of garnet on the side of Gore Mountain, one of the most prominent peaks in the region, Mr. Colvin says: "Nearer a small clearing below, at the mines, the cluster of log buildings used as store-houses for the garnet—here dug and exported as a substitute for emery—the great excavations, dumps and masses of refuse stone from the mines, indicate the extent of the workings. These mines are, perhaps, the most remarkable of their kind known; certainly the most notable in this section of the country. A vertical vein of perhaps 100 feet in thickness, richly charged with the mineral, here extends along the northerly face of the mountain, at an elevation of about 2,800 to 2,900 feet above the sea. The country rock on either side is a hard gneiss, containing very little mica, though broken crystals of what appeared to be biotite or phlogopite, were met with. The vein stone is of softer material than the country rock and is quite variable in its nature and composition.

"The remarkable feature of this vein consists in the innumerable crystals of the so-called pocket garnet with which it is filled. These crystals are almost as abundant as cobble stones in a bank of glacial drift; not by any means perfect crystals, but coarse, irregular clusters, of which the vein stone may be estimated to contain from 10 to 15 per cent., and in places 20 per cent. of the volume of the vein, all of deep red, irregular masses of mineral. They are found of all sizes, from small bits up to enormous pockets, a foot or more in diameter, and it is claimed that crystals of 3,000 pounds weight have been taken from this mine. These large crystals, however, are not permanently knitted together, for the decomposition of the

vein rock seems to have penetrated them also, so that frequently the broken fragments can be picked out easily with a stick, knife or trowel, and fall into the hands of the collector as dull, ruby-colored, disintegrated masses. In some cases huge crystals crumble so easily that a shovelful of broken garnet can be taken from a single pocket in the rock. Almost all of this material is valuable, for when prepared in the form of garnet paper it is preferable for use in the dressing of hard wood and in leather finishing, keeping sharper than corundum or emery, although it is not quite so dense; yet specimens are occasionally met with that approach corundum in hardness."



Comment on Timely Topics

MR. STURGIS AND THE DEWEY ARCH.

ON another page will be found an extract from an article by Russell Sturgis, who is widely known as an art critic, concerning the reproduction in permanent form of the Dewey Arch. The conclusions of Mr. Sturgis will doubtless call out much controversy and may not meet with the approval of a great many stone producers. This magazine has reprinted his words, not that it feels called upon to indorse or condemn any of his opinions, but for the sake of calling the attention of the stone men of the country to the necessity of improving the opportunity now before them. Mr. Sturgis is undoubtedly right in declaring that such an important work as this should not be undertaken without a thorough and searching investigation as to the best material to be employed. He has taken up in turn most of the varieties of stone, so that the committee, when appointed, should be called upon to take into account not only the various marbles and granites, but should extend their investigation so as to cover the bluestones, sandstones and limestones as well. In a great national undertaking like this, no matter what material is finally decided upon, there will almost certainly be little heart-burnings and jealousies. But if the committee goes to work with the spirit and thoroughness indicated by Mr. Sturgis, the result cannot but prove of great benefit to the stone producers of every kind, in bringing to the knowledge of the general public the merits and capabilities of their products. We trust that quarrymen everywhere will prove to be thoroughly awake to the opportunities offered them.

THE DEATH OF PROF. ORTON.

PROF. EDWARD ORTON, Ph.D., LL.D., of the Ohio State University, and State Geologist of Ohio, died suddenly of heart disease at his home in Columbus a few days ago. Prof. Orton was one of the most distinguished economic geologists of the United States, and his reports are models among the publications of their class. Last year he was elected to the presidency of the American Association for the Advancement of Science, and presided at the Columbus meeting. He was born on March 9, 1829, at Deposit, N. Y., was graduated from Hamilton College in 1848, and studied

theology at Lane University. He was president of Antioch College when, in 1873, he was called to the presidency of the Ohio State University in Columbus. He resigned that position in 1881, but retained a professorship in geology. Prof. Orton was made geologist of the State in 1885, and was active in the presentation of valuable reports. Owing to straitened financial conditions in the State it was impossible to carry along the survey on the broad and liberal lines that had been planned, but Prof. Orton did the best that was possible with the funds at his disposal, and the seven reports that have been issued under his name are not surpassed in scholarship and solid worth by those of any State. In the present number of STONE is a review of the last volume put forth under his direction, in the preparation of which he himself had a leading part. His death is a distinct blow to geological science and a loss that his State can scarcely replace.





A stone quarry has been opened on the A. D. Hillard farm, at Burtonsville, N. Y., to furnish stone for the dam at Schoharie Falls.

A stone crusher has been put to work in the Charles Will quarry, at South Dixon, Ill., crushing rock for roads.

The old quarry of the Lee Marble Company, at Lee, Mass., which has been idle for about four years, has been started up. The superintendent is W. H. Noonan, of Ogdensburg, N. Y., a quarryman of wide experience. A storage building is being erected so that dressed stone can be kept on hand in large quantities.

The Jasper Co-operative Stone Company is hard at work at its quarries on the north line of Rock County, Minn., filling an order from Chicago for 7,000 yards of paving blocks. Paving block cutters are in demand at the quarries.

A derrick broke at the Bowers stone quarries, near Mansfield, O., and dropped a large stone to the quarry floor. No one was injured, however.

The members of the Board of Public Works, of St. Paul, have recently inspected the stone quarries of Winona, Minn., with a view of using the Winona stone for street paving in the former city.

The Amberg Granite Company is in full operation, having secured contracts that will keep it busy for two years to come. About 100 men will be employed in the sheds, which have been idle since 1893. The quarry at Athelstane, belonging to the same company, will be worked as soon as it is pumped out.

A railroad spur has just been completed

into the Fletcher quarry at Port Clinton, O.

George W. Scott has come into the possession of the quarry at Haverhill, N. H., through redeeming its indebtedness, and he proposes to work it. As Mr. Scott is 90 years of age he will probably be the oldest active quarryman in the country.

The Freeport, Me., granite quarry and works, formerly owned by E. B. Mallett, have been purchased by Mr. Anderson, of Pittsburg, Pa., who will also operate the quarry at South Freeport. The facilities of the quarries will be improved so as to enable the new owner to increase the output.

The Webster City Stone Company, of Webster City, Ia., has just been formed, with Albert Swanson as business manager and Joseph W. Peterson as treasurer. A new quarry has been opened south of the city.

The Portage Entry Quarries Company has about completed its operations for the season and is now closing up shipments. About 200,000 feet of block stone has been quarried this season. Despite the great demand for stone, prices have been increased only slightly on two of the cheaper grades of stone. Large quantities of stone which were accumulated during the depressed season have been almost entirely absorbed, so that the company has scarcely enough stone on hand to carry it through the winter.

The stone crusher which was erected at the Bickford quarry, at Wilton Center, Ill., together with the buildings, has been removed to the Reitz quarry at the same place.

The Carthage Marble & White Lime Company, which is meeting with a most flattering demand for its stone, is making a number of improvements at its quarries at Carthage, Mo. A new boiler and hoisting house have been erected on a portion of the quarry from which the desirable rock has been used. A large new derrick has been erected also. A new section of the rock ledge at the east end of the quarry has been stripped and channeling machines will be put at work on it at once. The new derrick has been located with special reference to the removal of stone from this new portion of the quarry. A blacksmith shop with power blower and forge have been erected at the west end of the sawing works. The company is enterprising and fully abreast of the times.

E. S. Shattuck & Co. have erected a new shed for stonemasons in their quarry at Marshfield, Me. They are getting out stone for the new library building at Wayland, Mass.

The quarries of the Jefferson Marble Company, on Clugston Creek, twelve miles north of Colville, Wash., are to be equipped with modern machinery and work will be pushed on the quarries all winter.

The Momence Stone Company has been erecting a new stone crushing plant in the southern part of Momence, Ill.

It is reported that the Collins granite quarry, at East Bluehill, Me., consisting of thirty acres, has been sold to New York parties. Although the granite is of excellent quality the quarry has not been in operation for nearly eighteen years.

William Harper is working a large force of men in his quarries at Rock Falls, Ill., getting out building stone.

Extensive quarrying operations are being carried on at the quarries of Thistle Road, near Catonsville, Md. A large new stone crusher has recently been put in and is running full time, besides two steam drills.

It is reported that two new quarries are to be opened near Carthage, Mo. Carthage stone has been growing in popularity to a most remarkable extent.

The city of Raleigh, N. C., has just installed a new steam crusher, elevator, screens, etc., at the city rock quarry.

Mr. W. S. Winn, superintendent of the Government stone quarries, near Tuscum-

bia, Ala., has taken up his residence in that city.

The Wisconsin Granite Company, of Reedsburg, Wis., is running at full blast, producing from eight to ten carloads of stone a day.

Brayton & Kerr, of Kankakee, Ill., will put a night shift of fifteen men at work in their stone quarry, making a total force of about fifty men.

The current number of "The Quarry and Builders' Merchant," of London, gives the following account of the displacement of a large block of rock in the Kemnay quarries: "Recently a large and most valuable piece of rock was loosened from its bed and shifted to where it could be conveniently cut into sizes desired. The work preparatory to blasting had been in progress for weeks back. Along the back of the huge mass a series of twelve holes, each over twenty feet deep, were bored by means of the steam boring machine. These were charged with gunpowder and fired simultaneously by means of electricity. A succession of light charges were fired in order to loosen or shake the mass from its 'bed' (or, more properly, as applied to granite, 'fault'). This having been done, the final or larger charge was given, and so well had the quantity of powder required been calculated that the immense block was simply shifted forward into the desired place. The rock is of first-class quality, and the block displaced weighs over 9,000 tons. Some idea of the size of this block may be gathered from the fact that 1,125 railway wagons will be required for its transport, or a single train over four miles long."

The general report and statistics for the year 1898, relating to persons employed and accidents at mines and quarries in Great Britain, and to the enforcement of the Mines and Quarries Acts, has just been published as a Parliamentary Blue Book. In it is stated that the total number of persons employed at mines and at the quarries under the Quarries Act in the United Kingdom and the Isle of Man during the year 1898 was 875,603, of whom 741,125 were employed in or about mines, and 134,478 in or about quarries. Of the total 134,478 persons engaged in quarries, 62,752, including 7 females, worked inside the actual pits, holes or excavations, whilst 71,726, including 1,505 females, were employed

at factories and workshops outside. Most of the women and girls were engaged at brickworks connected with the quarries. As regards persons employed in or about granite quarries, 5,096 worked inside, and 4,003 outside, being together an increase of 632 on the year 1897. In Aberdeenshire the number of people employed in the quarries under the Quarries Act amounted to 2,033, or 169 more than the previous year. Of these 971 worked inside and the remainder outside. The total number of quarry workers in Banffshire is returned at 138; in Caithness, at 404; in Elginshire, at 191; in Forfar, at 955; in Inverness, at 55; in Kincardine, at 104; in Nairn, at 41; in Ross and Cromarty, at 62; and in Sutherland, at 18.

On Saturday, September 2, a huge blast was fired at the Bonawe granite quarry, Scotland, worked by the Messrs. Gardner & Co., of Glasgow. An account of the blast is given in the current number of the "Settmakers' and Stoneworkers' Journal," which says: "The work of driving the heading, forming the chamber, and clearing the quarry has been going on for upwards of two years. About 8,000 pounds of gunpowder was placed in the chamber, and it is estimated that not less than 60,000 tons of very fine rock has been displaced. It is considered by those conversant with such work, to be one of the most successful blasts which has taken place at Bonawe. With such a quantity of good rock, ample employment will be at the disposal of a considerably increased squad of men for some time. This mine will be followed by another and larger in five or six weeks. Mr. Fleming, of Fleming & Co., Glasgow, superintended the electric appliances which were used in firing the mine, and every care was taken to insure success, as with the electric cable, two specially prepared Bickfords fuses were inserted in the powder, so that in the event of failure of the electric battery or cable, the Bickfords fuse would be used. On the signal being given and the electricity being turned on, the huge mass of rock rose a few feet in the air in the shape of a mushroom, and opening out, collapsed amid a cloud of smoke and dust, and was lost to view for a few minutes. When the smoke and dust cleared away, a change of great magnitude was apparent to the onlookers in the face of the quarry. Stones of hundreds of tons were

now lying scattered over the floor, and one had the impression that an earthquake had taken place."

The Province of a Geological Survey.

The Americans appear to be more desirous than we are in England that their official geologists should undertake investigations which at first sight may seem to be outside the province of a geological survey conducted on old-fashioned lines, says "The Architect and Contract Reporter," of London. No doubt applications for information and advice are received in the various offices of the geological section of the Department of Science and Art. But those who have had experience of Government officials elsewhere hesitate before they seek for aid. In America the geologists realize the public requirements. For example, we find that Mr. W. B. Clark, the chief of the geological survey of Maryland, has been endeavoring to ascertain the permanence of building stones. For that purpose he has tested rectangular specimens from 1 to 1½ inch in diameter, by first drying out all the moisture by means of a water bath at a temperature of 212 degrees Fahrenheit. After they had cooled the specimens were weighed. They were next placed upon a set of glass shelves standing in a porcelain pan containing strong hydrochloric acid. An open bottle containing nitric acid and one containing hydrochloric acid and black oxide of manganese were placed close by, and the whole covered by a bell glass, forming an airtight chamber. After a period of seven weeks the stones were removed and washed, and the change in color, if any, was noted. As the colors of rocks are sometimes owing to a process of decomposition, and are not permanent, more information on a subject so interesting to architects is needed, but we seek for it in vain in English geological works.

The Japanese Coal Trade.

The situation of the coal trade in Japan is gloomy. There is an accumulation of over 700,000 tons of coal at Moji, awaiting demand. This adverse situation is the outcome of the indiscreet over-production on the part of the proprietors of coal mines, and they are only reaping the consequences of their lack of foresight and prudence.



Marble and Granite



Simon Klaber, a veteran marble dealer of No. 47 West Forty-second street, New York City, is dead. Mr. Klaber was born in 1824 in Prague, Bohemia, and came to New York when he was 21 years of age. He began work in a West Side marble yard and on September 14, 1849, fifty years, lacking two days, from the date of his death, he established the firm of S. Klaber & Co. Mr. Klaber was widely known in the marble trade throughout the United States and he had made for himself a wide circle of friends. He belonged to a number of societies and was held in high esteem.

Frederick C. Cook, Edgar G. Miller, Jr., and Randolph Barton, Jr., have been appointed receivers for the Woodstock Granite Company under bonds of \$10,000 each. The company was incorporated in Baltimore City, Md., but the quarry property is located in Baltimore County.

It is reported that a large granite crushing plant, which will furnish material for macadam roads, will be established at Waupaca, Wis. Inexhaustible granite ledges are found near the city.

The Pike River Granite Company, of Amberg, Wis., is reported to have all the orders on hand that it can fill.

The City of St. Joseph, Mo., has brought suit against Helsley Bros., contractors, for granite paving blocks. The blocks were taken up from one street, sold to the contractors, and laid in another street.

The Evans Marble Company, of Baltimore, Md., has purchased and will operate the marble quarries near Knoxville, formerly owned by T. S. Godfrey. It is said that the transfer involved the sum of \$100,000. The quarries are located from three to four miles above Knoxville, at the junction of the Holston and French Broad rivers. The quarry turns out the celebrated gray Knox marble, largely used for interior decoration. There is also quarried on the same property "Godfrey's Tennessee White."

The Fulton (O.) Marble Works has changed its title to the Topaz Monument Company. Mr. Charles Fox is proprietor and M. R. Doran manager.

Some weeks ago, Hugh Sisson & Sons, of Baltimore, sold their property on North street to the Pennsylvania railroad. The firm has now purchased for \$6,000 a large piece of property on Twenty-third street and Mount Vernon avenue, North Baltimore, adjoining the tracks of the Baltimore & Ohio Railroad. A switch will be run into the property and a two-story building, 125x45 feet, will be erected. The firm proposes to retire from the wholesale business and develop its cemetery and interior marble work trade.

John W. Leahy and Charles Dobson have formed a partnership under the firm name of Dobson & Leahy, and will conduct a monumental business on Park avenue, Knoxville, Tenn.

Efforts are being put forth to have the new depot of the Southern railway at Knoxville, Tenn., built and finished in East Tennessee marble. The marble producers are now figuring on the contract.

The Vermont Marble Company is erecting a new finishing shop at Proctor. Haley's mill will be raised one story and at the end of the mill a building 130 feet long will be put up for the rubbing beds and turning lathes on the ground floor, with the stone cutters on the floor above.

T. J. Abrahams, proprietor of the Austin (Minn.) Marble Works, has gone into voluntary bankruptcy with liabilities of \$13,000 and assets nominally about the same.

The Tayntor Granite Quarry at Hallowell, Me., is rapidly being developed.

The Milford (Mass.) quarries are more fully operated than ever before in their history.

Massachusetts reports more activity in building granite than in monumental stock. The outlook for future activity in the marble field is very bright, as seven different

firms have recently commenced quarrying operations at Adams, Westfield, West Stockbridge, Ashley Falls, Sheffield and Lee.

John S. Pool, of the assigned firm of Pool & Sons, marble and monument contractors of Louisville, Ky., has filed a deed of bankruptcy, fixing his liabilities at \$13,360.29, with merely nominal assets.

The W. H. Bairstow Marble & Granite Company has been incorporated at Evanston, Ill. Capital stock, \$8,000. Incorporators: W. H. Bairstow, Thomas D. Brees and Robert C. Harper.

Forbes & Cardot is the name of a new monumental firm established at Fredonia, N. Y.

A new white marble altar, the work of Prof. Carlo Nicoli, of Florence, Italy, has just been erected in the Duluth cathedral.

A. Y. Trogdon has removed his marble works from West Court street, Paris, Ill., to the site near the Vandalia depot.

Messrs. Ni'ea & Vinson have just established a granite monumental business at Walla Walla, Wash.

A phenomenal piece of granite has just been successfully blasted out at the quarry of the Hudson & Chester Granite Company, at Chester, Mass., which compares with and excels some of the historic stones in weight and quality. It measures 48 feet long, 42 feet wide and 12½ feet thick. It is sound and without a blemish, contains 25,200 cubic feet, and weighs 4,284,000 pounds. It has been photographed and many people have been to see it, and the sight is well worth the trip to the quarry.

The Portland (Ore.) Telegram says that "Snake River is beginning to produce as fine a quality of granite as can be found anywhere. A ledge has been found crossing the Snake where the three counties of Asotin, Wash.; Wallow, Ore., and Nez Perce, Ida., join, bearing a fine quality of dark gray granite. A sample of the stone, which in color and texture resembles the famous Barre granite of Vermont, was brought to Portland by A. B. Niles, of Walla Walla. A solid sheet of the stone 40 feet long and 12 feet in thickness is shown in a quarry that has been opened.

The Knoxville (Tenn.) "American" says: "The present development of the marble industry of East Tennessee, which has its headquarters at Knoxville, dates from a comparatively recent period. The business

has been extended during the past twenty years until it has become one of the greatest industries of the city, second in extent and value possibly to no other in amount of money invested, the total of annual output and sales and the wide extent of territory in which the output of Knoxville marble mills and quarries is sold and used. Tennessee marble is now famed the world over for its beauty and for its number of varieties which are quarried from the hills of Eastern Tennessee. Commercial and statistical reports give Tennessee third rank in the value of its marble production. Vermont ranking first and Georgia second. But these figures are based on reports made several years ago, and it is now claimed by experts that Tennessee should be given at least second place in the total value of her output. Former reports indeed give Tennessee second place in the value per cubic foot, the figures being for Vermont, \$2.03; Tennessee, \$1.32; Georgia, 79 cents." The Nashville "Sentinel" quotes the following from its Washington correspondent: "The marble quarries of my county have been liberally drawn upon in the construction of the magnificent Congressional library," says Prof. William M. Graybill, president of the Synodical College, Rogersville, Tenn., who is at present in the city. "I noticed with pleasure that Hawkins County marble is greatly in evidence in other public buildings at the capital. When the new line of railway from Knoxville to Bristol, work upon which has now commenced, is finished, it will run for many miles through beds of the finest marble in the United States."

The Jerry Builder in Hong Kong.

It would appear that Calcutta and Bombay are not the only places where jerry-built houses prevail, says "Indian Engineering." From Hong Kong we hear of houses collapsing from sheer inability to stand up unpropped! It is said that in that colony houses are now being built of the worst possible refuse ever designated as bricks; that walls are constructed without mortar, merely of dry blue bricks piled upon each other; that these walls are propped up with bamboo poles until the joists and roofs are put on to give them some semblance of "binding." This is a strong indictment, but there is unfortunately much truth in it.

Limestone and Sandstone.

A vein of tripoli was recently discovered by accident on the farm of A. H. Harbaugh, in Salt Creek Township, near Seymour, Ind. The vein is twenty-four inches long and, as far as investigated, seventy feet wide.

J. B. Crafton has opened an extensive quarry near Harrodsburg, Ind. Mr. Crafton has been working for a number of years to develop the property and to get railroad connection to the immense deposit of fine stone along Clear Creek and its tributaries. He now controls over 1,000 acres and is taking out large blocks of a fine gray buff stone.

Donald Sinclair has opened a new sandstone quarry within two miles of Makanda, in the southern part of Illinois. The first use that will be made of the stone will be the construction of several bridges at Mounds, Ill.

A new crusher with a daily capacity of 175 yards of stone has been added to the plant of the Sinclair Construction Company, at Kankakee, Ill.

The Erskine Limestone quarry, at Lowellville, O., which has been idle for a short time, is running again on full time.

The Duluth Brownstone Company, which owns a quarry at Fond du Lac, Wis., is furnishing stone for the new dry dock at Duluth. It is estimated that it will take 1,200 tons for the entire job and the stone is being delivered rapidly.

A valuable deposit of limestone has been opened up by Peter Joyce, in Pine Valley, near San Diego, Cal.

William O. Troy, foreman of the Consolidated quarry at Bloomington, Ind., has been transferred to the company's quarry at Dark Hollow, in Lawrence County.

The Stonemason Association, of Columbus, is bewailing the fact that the supply of stone in the local market is not nearly sufficient to meet the demand. There is said to be abundance of stone at the

quarries, but cars are not available to ship it.

The Union Pacific has a force of men putting in a switch for the Blue Springs & Wymore Stone Company, at Blue Springs, Neb.

The Wyoming Valley Stone Company has been organized to buy and develop the blue stone quarries of Adolph Semen, at Meshoppen, Pa. A. A. Sterling, cashier of the People's Bank, of Wilkesbarre, is president of the company; John H. Fellows, ex-mayor of Scranton, vice-president; N. N. Betts, cashier of the First National Bank of Towanda, treasurer; A. Gregory, sheriff of Wyoming county, secretary, and Adolph Semen, of Meshoppen, manager. The property of the company consists of two completely equipped mills for sawing and dressing stone and three large quarries with an inexhaustible supply of stone. The product of the quarries is a beautiful grained stone widely known as the Wyoming Valley bluestone. The company will immediately improve the plant.

Phosphate Trade of Tennessee.

The phosphate rock trade in Tennessee is a growing one. The deposits were found in 1893. The first shipments were made in 1894, and the following table shows how shipments have advanced since that year:

	Short tons.
1894 (from July 4).....	4,841
1895	45,324
1896	83,571
1897	142,225
1898	350,950
1899 (up to June 30).....	212,736

In 1898 Tennessee produced next to South Carolina. Florida led with 580,000 tons; South Carolina put out 500,000 tons, and Tennessee 301,000 tons. Tennessee is the newest State in this industry, and the increase has been so rapid that it gives promise of passing all competitors in the course of a few years.

Limes and Cements

A large deposit of white rock in Eastern Collin County, Tex., is to be opened up for lime making.

The Bellefonte (Pa.) Lime Company has been organized, with the following stockholders: J. W. Gephart, John P. Harris, L. T. Munson, Frank Warfield and John P. Harris, Jr., of Bellefonte, and C. M. Clement, of Reading. The company is capitalized at \$25,000 and will operate quarries and kilns recently purchased by the Bellefonte Furnace Company from A. G. Morris, of Salona. The principal output at present will consist of stone for furnace flux and crushed stone for railroad ballast.

The Granite Wall Plaster Company, of Youngstown, O., has increased its capital stock from \$15,000 to \$120,000.

Zorn, Horning & Co. are repairing their lime kilns at Gibsonburg, O., and will start them at once.

The Scioto Lime & Stone Co., of Delaware, O., is improving its plant and will erect three up-to-date lime kilns.

The plant of the Luray Lime Company, situated two miles west of Luray, Va., has been shut down and is said to be for sale.

An advance of 75 per cent. in cooperation has had a marked effect upon the lime trade, and a proposition has been made to the Western Lime Association to use paper barrels made of strong paper and bound with steel. The inventor offers to furnish the companies with machinery for making the barrels themselves.

The strike at the limestone quarries, at Carbon and Hilltown, Pa., has been settled by granting the quarrymen 20 cents per ton instead of 18 cents as formerly, and the laborers an advance of 10 cents, making the wages \$1.50 a day.

The Crescent White Lime Works has been organized at Johnson, Ark., with a capital stock of \$10,000. The output of the kilns will be 200 barrels a day. W. L. Stuckey is president, F. O. Gulley, secretary, and H. K. Wade, treasurer.

A fire at McCollum's lime plant, at Tiffin, O., did \$1,200 worth of damage.

Wabash, Ind., claims to have obtained excellent results by employing calcium carbide, after its use for generating acetylene gas, for mortar. It is said to give better results than any lime.

The McLoon & Stover Lime Company has uncovered a large tract of new rock in its quarries at Warren, near Rockland, Me. The rock is of a pure white color, of crystalline formation, and contains a larger per cent. of magnesia than any other stone found east of Ohio, it is said. The company owns about 260 acres and has built up quite a village around the kilns. Lime has been made at this place for more than 160 years, but the present company was organized in 1895 by the consolidation of two companies that formerly operated at that place. The controlling owners of the property are W. W. Case, Silas W. McLoon, Alden A. Stover and W. T. Cobb, Mr. Case, being the president of the company and Mr. McLoon the general manager.

The extensive plant of the Ohlemacher Lime Company, at Sandusky and Marblehead, O., including ten kilns, extensive quarries and a steam barge, have been purchased by the Kelly Island Lime & Transportation Company. The Ohlemacher Company began business in 1867 and its plant is one of the best in that section of the country.

An immense cement plant, which, it is reported, will cost \$250,000, is being erected southeast of Bedford, Ind.

Daniel Fitzpatrick has purchased 160 acres of land near Fort Dodge, Ia., for the gypsum deposits underlying it, and will erect a stucco mill.

There has been much talk about a projected lime trust to take in the manufacturers of Ohio, Indiana and Michigan. The American Lime Company was formed at Toledo, O., on October 5, and it is said

that it will embrace 97 per cent. of all the manufacturers in the three States named. The capital stock is \$3,000,000. Caleb E. Gowen, president and treasurer of the Kelly Island Lime & Transport Company, was asked by a reporter if his company is to be absorbed by the trust. Mr. Gowen had been approached once before in regard to the reported formation of a new company and had said that he did not care to discuss the matter, for the reason that he did not think that a new company was being formed. He said there is enough limestone in the State, outside of that controlled by companies already in the field, to supply a new company. "Our company is not in a trust," said Mr. Gowen, emphatically, "nor has it any intention of entering one. We do not believe in them. Last spring we were approached by people who wanted to form a trust, but we declined to do so. There are a number of small dealers who desire to form a combination to fight us, but they can fight until they are tired without injuring our business. We have no intention of increasing the price of lime. That rumor grew out of the fact, I suppose, that we are to increase our capital stock." Mr. Gowen said the present price of lime is 11 cents a bushel at wholesale. The present retail price is 19 cents, but this depends somewhat upon the cost of transportation.

Bacteria and the Decay of Cement.

A paper by A. Stutzer and R. Hartleb on this subject in the "Zeitschrift angew. Chem." is abstracted in "The Analyst." In 1896, Stutzer observed that the cement mortar which had been in use for eight or nine years as lining to a water-supply reservoir was converted into a brownish mud, containing less lime and more iron oxide, etc., than the original cement. This disintegration he ascribed, and still believes to be primarily due, to the solvent action of the carbon dioxide in the water, which dissolved the lime of the cement in the form of bicarbonate. But on extracting further samples of the mud from the same reservoir lately with sterilized water, the present authors found that it was highly charged with nitrifying organisms; so much so that when introduced into a 0.1 per cent. solution of ammonium sulphate, the ammonia reaction practically disappeared in fourteen

days, and nitrite reactions were given powerfully. A similar experiment with asparagine only gave a nitrite reaction after six weeks, but here it was necessary for ammonia first to be formed before nitrification could set in. A further test with a 0.1 per cent. solution of sodium nitrite showed that nitrites were formed but slowly. It would appear possible, therefore, in the case of waters containing any appreciable proportion of oxidizable nitrogenous matter, that this production of nitrous acid by the agency of micro-organisms may play some part in the destruction of cement. The parallel action that is noticed in sea-water, unless the cement is fortified by the addition of extra active silica, is due rather to the soluble sulphates than to carbon dioxide, which is not present in such large quantities as in fresh water; it has not been feasible to determine whether bacteria assist in this disintegration likewise.

With reference to this matter, G. Barth, in the same journal, quotes another instance of cement decomposition occurring in three years where the water contained no unusual amount of carbon dioxide, and he seems to consider the previous explanation plausible.

Good Lime.

A good lime should possess the following qualities: When delivered, it should be in hard lumps, free from slaked particles of dust. There should be no cinders nor clinkers in it, nor should there be more than 10 per cent. of other impurities in it. It should slake readily in water, forming a very fine, smooth paste, without any residue. It should dissolve freely in soft water. Lime that leaves kernels of stones and traces of silica and alumina when "run off" should not be employed for plastering, but may be used in common masonry and brick work with fairly good results.

A New Graphite Company.

The Standard Graphite Company, a recently organized concern, is erecting a plant which it will call the Keystone Mills, near Phoenixville, Pa. These mills will be furnished with machinery of special design and the plant will be one of the best equipped anywhere in the world. The graphite deposit which joins the mill is of unusual richness and high quality.



Stone Trade Notes

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BY THE AMERICAN STONE CUTTERS ASSOCIATION

THE TRADE JOURNAL

OF THE STONE CUTTING INDUSTRY

IN THE UNITED STATES AND CANADA

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THE TRADE JOURNAL

David Archie, a well-known stonecutter of Amberg, Wis., was recently killed by a train.

Messrs. Donahue & Olsen, of Rochester, Minn., have been awarded the contract for building 786 running feet of stone arch work and 340 running feet of smaller arches on the Rochester extension of the Winona & Western Railroad.

The Wisconsin Granite Company will furnish 100 cars of stone for ballast to the C. & N. W. Railway.

Vienna, Ill., will purchase a new stone crusher.

J. P. Gordon, of Franklin, Me., a prominent stone man, will, it is said, retire from business.

Alexander B. McGill, proprietor of the Bergholz stone quarry, in Carroll County, O., was instantly killed by driving over a railroad embankment. He was 61 years of age.

George A. Bradley, a well-known stonecutter of Bryan, O., is dead, aged 42 years.

Marinette, Wis., will purchase 1,000 cords of stone from the farmers of the county for improving the highways.

The Menomonee Falls (Wis.) stone will be used for the mason work on the lock of the Oconomowoc River.

A proposition is now made to erect permanent buildings at the Toledo Centennial and the stone men of the State are asked to contribute stone.

Gillen & Gillen, of Duck Creek, Wis., have been awarded the contract to furnish 22,000 cubic feet of heavy coursing stone for the lock of the United States Government at Appleton, which is to be rebuilt next winter.

Two scows carrying stone for the Laurie Company, from Sturgeon Bay, Wis., to Manistee, Mich., were caught in a heavy storm and lost much of their deck cargo of stone.

Col. J. S. Culver, president of the Culver Stone Company, of Springfield, O., says that that city is having the biggest building boom in its history. The Culver mills have recently had a large finishing

department fitted up with lathes, planers and rubbing beds and have been running twenty-four hours a day. Two shifts of men are kept busy.

What is supposed to be the skeleton of a prehistoric man has been discovered in a stone quarry near Akron, O. The man is thought to have been nearly ten feet high. There were also found deer antlers, bear claws, animal teeth, pottery, etc.

A union of stonecutters will probably be formed among the quarrymen of Duck Creek, Wis.

H. Y. Simpson, Laurens, S. C., will put in a plant for sawing soapstone.

Louis A. Tahud, a prominent stone cutter of Dayton, O., is dead at the age of 48 years.

James Fitzgerald, aged 50 years, an employee of the National Stone Company, of Chagrin Falls, O., was assaulted by highwaymen recently and so seriously injured that he died.

Andrew Boesch, aged 18 years, was probably fatally injured by losing control of a hand derrick in the Wittenmeier stone yard at Columbus, O.

Minneapolis has a controversy on hand in relation to the furnishing of broken rock by the workhouse to the city free of charge. The Board of Charities and Corrections claims that if the workhouse furnishes the rock free it will be cut off from one of its main sources of revenue.

Lemont, Ill., has a petition for an injunction against the Chicago drainage canal on the ground that a three-foot wall should be erected on one side of the highway leading to the bridge crossing the canal at Stevens street, Lemont. The city claims that the highway would be dangerous to travelers unless so protected.

Fatal Explosion at a Stone Crushing Plant.

A few days ago an explosion at the stone crushing works of Foss & Conklin, at Rockland Lake, killed four men and seriously injured four others. The men had

taken refuge in a shanty to escape a blast in the quarry some distance away, when, in some unexplained manner, a fire broke out in the shanty and a terrible explosion followed. Three of the men killed were Austrians and one an American.

Stone Crushers for Cities.

Batavia, N. Y.—At the November election the citizens will vote on the question of purchasing a stone crusher.

Davenport, Ia.—The advisability of the purchase of a stone crusher is under consideration.

Little Rock, Ark.—The capitol commissioners have decided to purchase a rock crusher, and proceed with the foundation of the new State house.

terminated. The microbe of typhoid fever, for instance, remains alive three days, that of diphtheria a month, and that of pneumonia from fifteen days to three weeks. The knowledge of these facts should bring about useful practical applications. The dampness of dwelling-houses appears doubly dangerous, first, in itself, and second, because of the long life which it gives to the elements of contagion and infection. Contrary to the traditions of the elegance of dwellings, which cause the walls to be covered with tapestry or paper in imitation of it, scientific experience would advise the employment of stucco or good varnish, which are best from a bactericidal point of view, both because they are easily washed and because they possess the property of cleansing themselves promptly and spontaneously of pathogenic germs which become lodged on them.

Damp Walls and Disease.

It is a matter of general interest to know how long disease germs will remain in a contagious condition in a house when the latter has not been thoroughly disinfected. Some special investigations have been made on this point by M. Vito lo Bosco, a hygienist of Palermo, Italy, says "L'Illustration." The investigations were made of the walls of dwellings exclusively, as the floors are generally easily cleaned and disinfected. The life of the pathogenic germs was found to vary greatly with the different materials of which the walls were constructed, and especially according to their degree of dampness or dryness. As a general rule, walls covered with stucco or varnish were found least favorable for prolonging the life of the microbes, and walls which are normally dry possess to a considerable degree the power of self-cleansing. The typhoid bacillus, the cholera germ, the diplococcus of pneumonia, when placed on such walls, die after twenty-four hours at the maximum, and the diphtheria bacillus survives only seven days. The tuberculosis microbe only can remain alive two or three months. On well-dried size, however, it survives even four or five months. Damp walls, on the contrary, cause the vitality of bacilli to increase, and this to such a degree that the period of life of some under these conditions has not yet been de-

New Workingmen's Home in London.

Ealing has adopted an attractive scheme for the erection of municipal workmen's dwellings. The site which is under contract for purchase for the purpose by the Urban District Council is known as Brown's Orchard, and is situated at the corner of Ealing Road South and Pope's Lane. It is six and one-half acres in extent, with two entrance roads in the first-named thoroughfare. It is bounded on the east by an old public path and on the south by the cemetery. A draft scheme has been prepared which provides for the erection of two classes of houses on the estate, at rentals of 6s 6d and 8s 6d respectively, the total expenditure on which works out at 37,300l. The frontages on the two new roads will allow of the erection of 121 cottages on plots eighty feet deep. The first class of houses will consist of fifty-four cottages, having four bedrooms, sitting-room, living-room, scullery, larder and w.c. In the second-class houses, sixty-seven in number, the accommodation will be the same, except that there will be two bedrooms instead of four. This scheme owes its inception to Mr. H. C. Groome, a progressive member of the council, who has had active support not only from his own party, but also from other sections of the council.



Monumental News



Louisville, Ky., will receive a fine bronze statue of Thomas Jefferson, costing \$50,000, a gift to the city from two brothers named Bernheim, wealthy residents. The statue is the work of Moses Ezekiel, the American sculptor.

Vermont is to have a group of monuments on the Gettysburg battlefield, about 300 feet from the "Bloody Angle."

Ground has been broken for the foundation of the statue of Gov. Pillsbury, to be erected on the college grounds at Minneapolis, Minn.

San Francisco has raised nearly \$40,000 for the monument commemorative of Dewey's victory at Manila.

Salinas, Cal., is raising a fund for a monument to Sheriff Farley, who was murdered on September 18.

Toronto is again agitating the subject of a monument to Gov. Simcoe, the founder of the city.

The sum of \$1,000 is already in hand for the erection of a replica of Trentonoe's statue of Pere Marquette, on Mackinac Island.

The announcement is made that the Brigham Young statue, at Salt Lake City, will be completed in a short time. Nearly \$30,000 has been spent already. Sculptor Dallin is making bronze medallions representing groups of pioneers and Indians for the pedestal.

The Harrison Granite Company, of Barre, Vt., has been awarded the contract for the monument to be erected at Columbus, O., in memory of Bishop Watterson. The monument will be a canopy sarcophagus of classic design, the ground plan and general outline to be cruciform. The dimensions will be nine feet in length at the base, six feet four inches in width, and eight feet in height.

Designs have been asked for a monument at Antietam, to mark the spot where Gen. Joseph K. F. Mansfield was killed. The

State of Connecticut has appropriated \$1,000, which will be used exclusively for the shaft.

The Arkansas Confederate Veterans have \$4,000 on hand for a monument at Little Rock.

Dane County, Wis., is working actively and with good prospects of success for a soldiers' monument.

What is said to be the largest sarcophagus in the country has been erected by D. S. Moses, at Oshkosh, Wis. It is a solid block of Barre granite nine feet long, five feet eight and one-half inches wide, and five feet high. It weighs over eighteen tons.

Work has been begun on a soldiers' monument at Caledonia, N. Y. Messrs. J. M. Hamilton & Son, of Batavia, have the contract.

Miss Bessie Potter, the well-known Chicago sculptor, has married Robert William Vonnoh, the portrait painter.

Nearly \$25,000 has been raised for a monument to Gov. Flower, at Watertown.

The plans of Peabody & Stearns have been adopted by the City Council of Boston for the monument to be erected at Dorchester Heights, where Gen. Washington stood and watched the British sail away. The plan shows a colonial tower built of old-fashioned brick with dark headers. The trimmings will be of Indiana limestone or white terra cotta.

Illinois has appropriated \$9,000 for a statue of Frances A. Willard, which will be the second statue that Illinois will place in the Statuary Hall, at Washington. It is suggested that Miss Willard's statue be made by a woman sculptor.

Renewed efforts are to be made for the erection of a monument to Gen. Forrest, in the city of Memphis. The sum of \$3,500 toward this end was raised years ago and is now in the bank. It is suggested that the monument take the form of an equestrian statue.

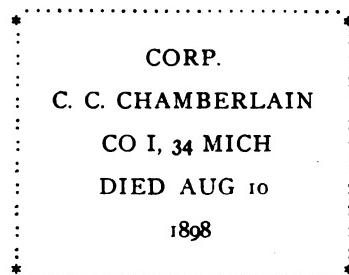
Richard Drone has established a marble and granite monumental business on North Fourth street, Zanesville, O.

Mr. John C. Reichle has bought out the interest of his partner, Frederick Miller, in the Miller & Reichle marble and granite works, at Tell City, Ind.

A Soldier's Headstone.

The Eaton Rapids (Mich.) "Review" says: At the marble works of J. DeCoursey can be seen an odd looking marker for a soldier's grave, which was sent from Santiago, Cuba, with the remains of C. C. Chamberlain who went from Charlotte as a corporal of Company I, Thirty-fourth Michigan, and died at that place.

The stone is made of material similar to that used for sidewalks in this city, and is a shingle used on the houses in that country. It is 8x14 inches in size and about 2 inches thick. The lieutenant of the company cut the inscription on it with a pocket knife, and it is a very good job, reading as follows:



When the remains of Corporal Chamberlain were sent home this head-stone was placed in the coffin. The friends of the deceased were anxious to preserve it, and will have it placed in a piece of marble and covered with a glass.

Modernizing the Royal Vaults at Windsor.

The burial vaults built by George III. at St. George's Chapel, Windsor, for the members of his house are being modernized by order of the Queen, says an English exchange. Hitherto they have had all the associations of gloom that harmonize with their use. They have been sealed by heavy slabs of iron, and have been explored only by the light of lantern or can-

dle. Now they are to be made more accessible by means of an ordinary doorway, and are to be illuminated upon occasion by the electric light. Moreover, the coffins are to be more symmetrically arranged on the shelves provided for the purpose, instead of being laid, as many have been, on a stone table that runs down the middle. Here lie, among many others of the more modern line, George III. and George IV., William IV., Queen Adelaide, the Dukes of York and Kent—the latter the Queen's father—the Princess Charlotte, and the Duchess of Teck. Little they'llreck if we let them sleep on, but the changes will give legitimate satisfaction to the living, who may naturally wish to show their filial piety by a reverent care of their dead. Such offices are sometimes strangely neglected, even in royal mausoleums. The coffins of the Hapsburgs in the vaults of the Capuchin church at Vienna lie generally in "most admired disorder" on the stone floor. There is no care in the arrangement, and their position suggests that each one as it came was just dropped down in the first vacant space, and there left.

The Density of the Earth.

Messrs. Franz Richarz and Otto Krigar Menzel have now submitted to the Royal Prussian Academy in Berlin the results of their investigations on the average density of the earth, started fifteen years ago on the initiative of the late Prof. Helmholtz. The Royal Prussian Ministry of War took a great interest in this important work, and gave the investigators every moral and financial support. Amongst other things they provided the experimenters with a solid piece of lead, weighing 100,000 kilogrammes, and moulded by the gun foundry at Spandau. The report now submitted contains all the details of the experiments extending over a period of fully fifteen years. The final result is that the average density of our planet is estimated at 5.05 (water=1). Thus the total weight of our planet would be about 5,600 trillions of tons (of 1,000 kilo). One may justly reason that this figure is correct within sixty trillions of tons, a small error considering that it amounts only to 1.06 per cent., but rather large if one considers that it represents about 25,000 times the weight of the whole Himalaya mountains.

The Slate Trade

The Pen Argyle "Index" publishes an interesting sketch of the development of the town and declares that of all of its famous slate quarries, eighteen of them are within less than a mile of the postoffice. They represent millions of invested capital, have an annual output of about 350,000 squares of slate, worth \$1,000,000, and pay 2,000 men over \$700,000 a year. Moreover this output is principally No. 1 slate, and not a single quarry of it shows any signs of exhaustion.

The Proctor Slate Company has been incorporated at Cardiff, Md., for the mining of slate, stone, etc. The capital stock is \$125,000. The principal stockholders are Jeremiah B. Proctor, Edward Proctor and George C. Proctor.

One Monday recently the Grand Central Slate Company, of Pen Argyl, started in to fill a rush order for 1,600 square feet of blackboards. The boards had to be quarried, split, finished and crated for shipment, and by Tuesday noon they were loaded on a car and on their way to their destination. The company reports that the month of September was the best it has had in the way of production since its organization.

The Crome Slate Manufacturing Company, recently organized under a New Jersey charter, is operating the North Bangor quarry, with Kirk Real, of Wind Gap, as manager.

John Masters will open a new quarry just west of the West Albion (Pa.) quarry.

The slaters at the Washington quarry, at Bangor, struck for an increase of 10 cents a square.

Robert J. Williams has opened a new quarry on his farm in Wells, Vt., which produces large quantities of slate in three colors.

Slate producers, of Slatington, declare that the present year will probably exceed any previous one in the production from the local quarries.

The output of the marble and slate quarries of Rutland county, Vt., will undoubt-

edly be larger than in any previous year. Some slate quarries have been compelled to refuse orders for this year's delivery. But a few years ago quantities of roofing slate were imported from Wales. Now a large part of the product of the Vermont slate quarries goes to England and the Continent.

Fair Haven Correspondence.

Fair Haven, Vt., Oct. 13, 1899.

Bolger Bros. have leased the Hanger Company's mill for a short time.

W. Lloyd, of the firm of R. E. Lloyd & Co., has just returned from England, where he has been in the interest of his firm. Mr. Lloyd's stay was short. His view was that the old country may be slower than here but what they do is done thoroughly.

As hinted in our last month's correspondence, the price of all milled slate stock has been raised, owing to the increased cost of materials used in its production and the great demand.

James Coulman, senior member of the firm of Coulman & Westcott, is under special treatment in New York for general weakness. Mr. Westcott, his son-in-law, accompanied him. Mr. James Coulman was one of the pioneers of the finished or marbleized slate industries in this country.

Mr. James O. Day is prospecting for slate on a farm just on the borders of the village.

McDonough & O'Day contemplate opening a quarry on the same vein as that now worked by Bolger Bros.

S. Allen & Co. have an extensive order for special slate vats, used by a large firm for the reduction of metals. Slate is about the best material that can be used for this purpose as it is affected by very few acids.

Minogue Bros. & Quinn have got their new boiler fixed and teams are again drawing stock from the quarries. The delay has been aggravating, as they are overstocked with orders.

The Durick Keenan Company are open-

ing a new quarry to keep pace with their ever-increasing business.

G. B. BENFORD.

Wearing Away the Sand Beaches.

The erosion of cliffs and land bordering on the sea by the action of the waves has long been observed, and in this country the ordnance survey has from time to time made us acquainted with the rate at which this wearing away is proceeding at various parts of the country, says an English exchange. In Holland a systematic series of measurements has been made by the Department of the Waterstaat since 1843, by means of oak posts placed along the Dutch coast from Helder to the Hook of Holland. The results are recorded in the proceedings of the Dutch Institution of Civil Engineers, and generally the measurements show that during the last half century the sea has been encroaching on the Dutch coast. The low water line has crept landward, and the beach has become more steep, while there has also been a washing away of the sand dunes. For the first half of the period, from 1843 to 1856, there appears to have been a retreat of the low-water line from shore, and consequent increase in the width of the beach in the northern portion of the coast, and this continued up to 1866 to a less extent. After this the low-water line began to advance landwards until 1877, when the northern beach began to grow wider, but the decrease continued along the southern half. On an average there has been a loss of beach along the whole coast between 1846 and 1894, the total average for North Holland being 155 feet, and for South Holland 108 feet. The greatest difference has taken place between Helder and Petten, a distance of twelve miles, where the low-water line has advanced inland an average of 160 feet, but at three place within the twelve miles of coast the low-water line is 200 feet, 270 feet, and 300 feet further landward than in 1846.

The Purpose of Stonehenge.

The number of theories about the purpose for which Stonehenge was erected is extraordinary, says "The Architect and Contract Reporter." Hardly two archaeologists will be found to agree on the subject. Another addition was brought

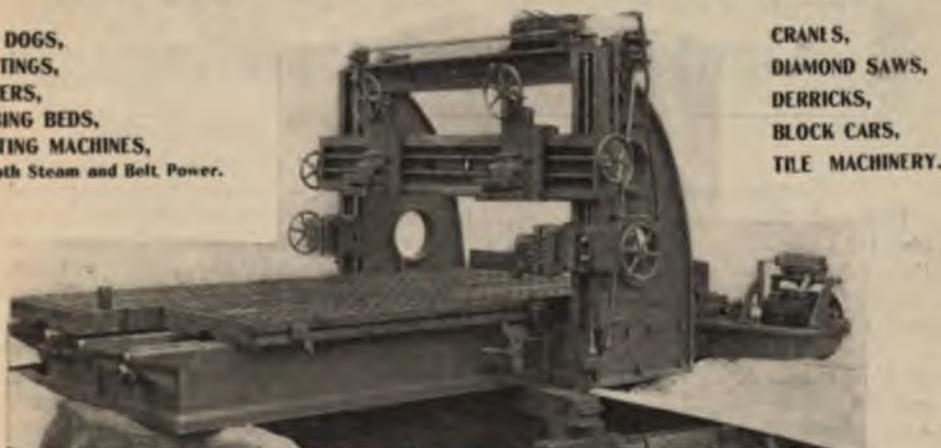
before the British Association by Dr. Alfred Eddowes. He believes that the thirty large upright stones, with their intervals, indicate that the circle was divided into sixty equal parts; that the grooved stone (which is the best selected, worked and preserved stone in the whole ruin, but has never hitherto received the attention it deserved), was used for supporting a pole in a definite and permanent manner; and that the signs of wear at the mouth of the groove, together with the two worn horizontal hollows or waists, and the dimples on the convex back of the stone, indicate not only where, but how, this pole was fixed. Such a pole would form the pointer of a sun-dial for daily observation, or, what was more important—an indicator of the time of year, by the length of its shadow. The levelled avenue (along which the sun's shadow would fall about 3 p. m.) and the flat "slaughterstone" with its arrow-head marking are considered by Dr. Eddowes to support his view.

Cement Wash for Protecting Iron-work.

Coatings of cement have been employed by certain railway companies in France for some years past, to protect the metallic portions of bridges crossing their lines from the rapid destruction to which such parts are liable by reason of oxidation, through being continually exposed to the action of steam and gas, products of combustion escaping from the locomotives. A method of applying the cement which is used in Austria and is highly spoken of, is described in "La Revue Technique." It consists in brushing down the ironwork with a leather broom, damping it with a whitewash brush, and afterwards applying two coats of Portland cement wash made rather thick, and having added to it a proportion of fine sharp sand. At Zeebrugge, in Belgium, where a deep-water harbor is now in course of construction, a portion of the pier of 300 metres in length is being formed of open work, and the steel piles of this part are covered with a coating of semi-fluid cement mortar, applied by means of an apparatus worked by compressed air; the piles having first been subjected to a preliminary cleansing by means of a sand-blast projected by the same air pressure apparatus.

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New Discoveries in the Forum.

A discovery of capital importance has just been made by Signor Giacomo Boni in the Forum on the site of the Basilica Ænilia. Five or six huge blocks of white marble were found in the positions which they must have occupied since falling from the facade of the original structure. One of these blocks, which is broken in two parts, bears a magnificent inscription stating that the basilica was restored in the

fourteenth year of the reign of Augustus by Tiberius, son of Augustus and nephew of Divus Julius Cæsar. The discovery of this important fragment on the outskirts of the area now in course of excavation constitutes evidence that the remainder of the edifice will shortly be brought to light. Some of the blocks discovered bear traces of fire. Several columns of red Egyptian granite were also unearthed on the same spot.

Contracts and Building

Government Work.

Hayward, Wis.—Plans have been completed for an Indian school at the La Pointe Indian Agency, to cost \$60,000.

Kiowa Agency, O. T.—Proposals will be received at the office of Indian Affairs, Department of the Interior, Washington, until November 13, for furnishing material and the construction of sewer and water-work systems at each of the schools, Fort Sill, Riverside and Rainy Mountains, at the Kiowa agency.

Pima Agency, I. T.—Proposals will be received at the office of Indian Affairs, Department of the Interior, Washington, until November 9, for furnishing materials and erecting a brick schoolhouse and a sewer and water system here.

St. Augustine, Fla.—Proposals will be received until November 3, for delivering 27,000 tons, more or less, of stone in place in jetties at the mouth of St. Johns River, Florida. Address C. H. McKinstry, captain Engineers, St. Augustine.

Washington, D. C.—The plans prepared by George B. Post, of New York, have been accepted for the proposed Building of Justice at this place. Estimated cost \$900,000.

Colleges, Schools and Libraries.

Atlanta, Ga.—The trustees will invite competitive plans for building the new library. W. M. Kelley, trustee.

Baltimore, Md.—An appropriation of \$50,000 has been made for building a school at North avenue and Pulaski street.

Chattanooga, Tenn.—The county court proposes to establish a general county high school. John H. Hogan, chairman.

Chicago, Ill.—Graham Harris, president of the Board of Education, has asked for an appropriation to build twenty-five schools.

Conneaut, O.—Andrew Carnegie has made public his plans to give the citizens of Conneaut, and the dock laborers he employs at the harbor, a fine public library

building. The drawing have been approved by him.

Des Moines, Ia.—Henry Liebbe, who is State architect and superintendent of buildings, has prepared plans for several buildings for which appropriation will be asked this winter; \$200,000 building for the agricultural college at Ames; \$125,000 building for Cedar Falls Normal School; \$60,000 hospital building for Glenwood school.

Dixon, Ill.—A \$12,000 high school will be erected at North Dixon.

Feehanville, Ill.—St. Mary's training school for boys burned. The school will be rebuilt at once. Loss, \$150,000.

Gainesville, Ga.—Wilson & Edwards, of Charleston, have prepared plans for the \$15,000 school to be erected here.

Milwaukee, Wis.—\$60,000 in bonds have been authorized to erect a school house in the Eighteenth ward.

Morgantown, W. Va.—The West Virginia University will erect a library, a mechanical hall, and an armory. Wilson Bros. & Co., architects, Drexel Building, Philadelphia.

Muscogee, I. T.—The Spalding Institute (Methodist) burned. Loss, \$30,000, with insurance at \$10,000. The building will be re-erected at once.

Niles, Mich.—C. R. Dennison, of Warren, has prepared plans for a \$40,000 school building to be erected in the spring.

Oswego Falls, N. Y.—A site has been purchased for a union school.

Peoria, Ill.—The Bradley Institute, at Peoria, is to be enlarged at a cost of \$250,000. Work will be commenced early in the spring.

Philadelphia.—Plans are being prepared for a four-story modern school building at Fifty-eighth street and Haverford avenue, to cost \$70,000.

St. Paul, Minn.—The St. Joseph Orphan Society has made application for a permit to erect a \$55,000 building.

Waterloo, N. Y.—The town will vote on a proposition to spend \$31,000 in building

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Wonewoc, Wis.—Chandlen & Park, of Racine, have prepared plans for a \$15,000 schoolhouse, to be erected at Wonewoc.

Churches.

Celina, O.—The Catholic Church of the Immaculate Conception will build a \$100,000 church. Rev. S. D. Schunk, pastor.

Indianapolis, Ind.—A new Catholic church and school will be erected at Northwestern avenue and Twenty-eighth street. Rev. S. J. Donahue, pastor.

Leroy, Wis.—The Catholic Society will build a \$15,000 church. Anton Dohmen, Milwaukee, architect. Rev. J. W. Blum, pastor.

Lincoln, Neb.—\$17,000 has been subscribed towards building St. Paul's M. E. Church. Rev. F. L. Wharton, pastor.

Louisville, Ky.—The Fourth Avenue M. E. Society has decided upon plans for the new church. Contracts will be let this fall. Rev. James W. Moore.

Mount Carmel, Ill.—St. Mary's Catholic Society will erect a brick and stone church. S. Z. Landes, secretary building committee.

Neenah, Wis.—\$27,000 has been secured for the erection of the proposed Presbyterian church.

Neoga, Ill.—The Presbyterian society has decided to build an \$80,000 church.

New York, N. Y.—Carrere & Hastings are preparing plans for a granite church, to be erected for the First Church of Christ (Scientist), 100x140, on the north corner of Central park West and Ninety-sixth street, to cost about \$175,000.

Philadelphia, Pa.—The Catholic Church of the Ascension will build a \$35,000 church and school at G and Westmoreland streets. Rev. D. J. Broughal.

City and County Buildings, Hospitals, Etc.

Atlanta, Ga.—Bids will be received November 27 for the completion of an independent annex for the Fulton county court house, 104x123, portico, three stories and basement in height, to be built of stone, brick and steel.

Charleston, Mo.—The proposition to issue \$25,000 court house bonds was carried by a large majority.

Dixon, Ill.—C. E. Brush, 939-218 La-

Salle street, Chicago, has been awarded the contract for the drawing of plans for the new Lee county court house, to be located at Dixon, at a cost of \$100,000.

El Reno, O. T.—The question of issuing \$50,000 court house bonds will be voted upon at the November election.

Herkimer, N. Y.—The contract for the erection of the Montgomery county almshouse has been awarded to John Nelson. The architect is Linne Kinne, and both are of Herkimer.

Hudson, N. Y.—Columbia county will erect a new jail here. Henry C. Moul, architect.

La Crosse, Wis.—The Norwegian Evangelical Lutheran Church of America, will build an eighty-room Hospital this fall.

Minneapolis, Minn.—The plans prepared by E. P. Overmier, for the new Asbury hospital have been accepted for the building to be erected at Fourteenth avenue and Tenth street South. Estimated cost, \$100,000.

New Orleans, La.—The plans prepared by City Engineer Bell have been accepted for the proposed prison. Bids will be received November 1.

Norwich, N. Y.—The Chenango county supervisors have under consideration the erection of a \$14,000 jail. The present was built sixty years ago.

Scranton, Pa.—It is reported that the Y. M. C. A. will erect a \$200,000 hall here.

Selma, Ala.—Bids will be received November 6 for the purchase of \$40,000 court-house and jail bonds. Hon. P. G. Wood, probate judge.

Sharpsville, Pa.—The council has decided to build a town hall, to include fire department rooms, lockup and council rooms.

Wilkesbarre, Pa.—The old wooden structure of the Wilkesbarre City Hospital will be removed and a substantial stone and brick building in harmony with the other buildings will replace it. The structure will cost \$35,000.

Winchester, Va.—The work will begin at an early date on the erection of a \$30,000 public building.

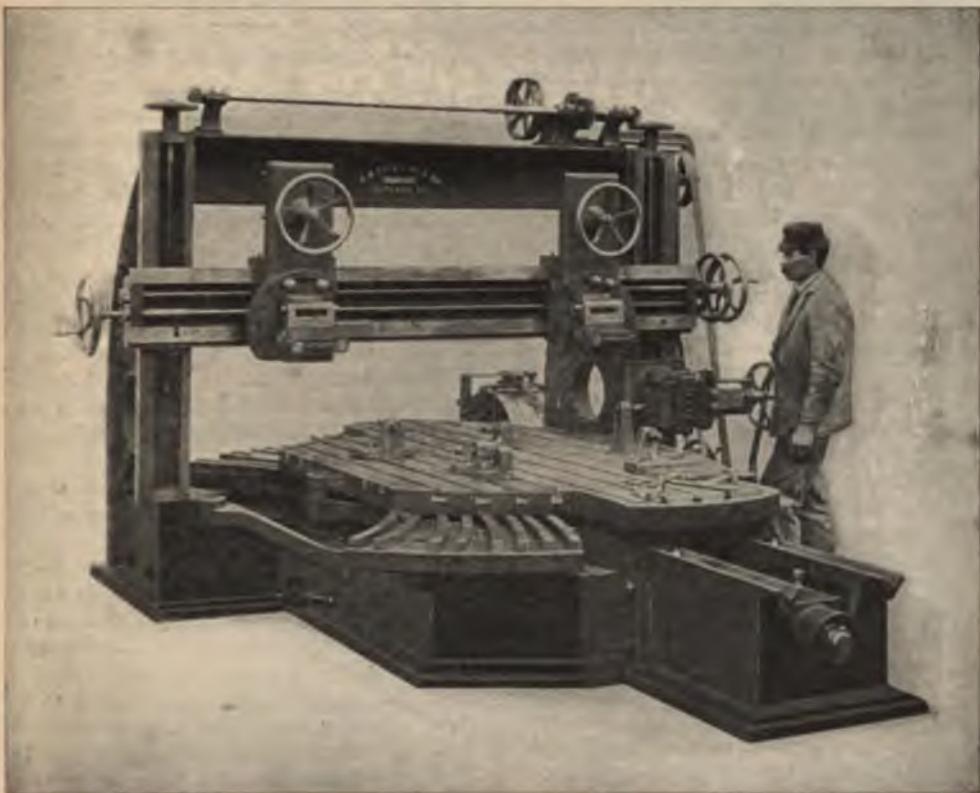
Winona, Minn.—The city council has decided to build a city hall.

Business Buildings, Hotels, Opera Houses, Clubs, Etc.

Allegheny, Pa.—Charles Wolfendale has purchased a site on Federal street, near

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Robinson street, for \$28,000, for the erection of a hotel.

Atlantic City, N. J.—Horace Trumbauer, Land, Title and Trust Building, Philadelphia, is preparing plans for a large hotel to be built here for Thomas Green, of 3601 Chestnut street, Philadelphia. The structure will be of brick and stone and have a steel framework.

Battle Creek, Mich.—The Athelstan Club, composed of 300 business men, have taken steps toward building a \$20,000 club-house.

Buffalo, N. Y.—It is reported that a new hotel, costing in the neighborhood of \$150,000, is to be erected at the corner of Clinton and Washington streets. The building is to be fireproof, eight stories high and it is to contain 500 rooms.

Cedar Rapids.—Fred J. Brown has been awarded the contract for the erection of a \$19,000 auditorium of brick and stone.

Chattanooga, Tenn.—R. H. Hunt is preparing plans for a brick and stone office building, to be erected shortly at King and Market streets.

Cincinnati, O.—The Union Savings Bank & Trust Company will erect a \$250,000 business building at Fourth and Walnut streets.

Des Moines, Ia.—Liebbe, Nourse & Rasmussen, architects, have prepared plans for a seven-story building for the Harris-Emergy Company.

Kingston, Ont.—The Grand Opera House Company, of Kingston, Ltd., has been incorporated, with a capital of \$30,000. B. W. Fogler, R. J. Carson and I. A. Breck.

La Crosse, Wis.—J. A. Mollier, Pabst Building, Milwaukee, has prepared plans for a \$15,000 Masonic Temple, to be erected by the Masonic Hall Association.

Louisville, Ky.—A site has been purchased on the corner of Market and Third streets for the erection of a seven-story business building.

Marietta, O.—The Masonic Society have purchased a site on Second street, for building a temple. Plans have not been prepared, but it is proposed to build a five-story building.

Neenah, Wis.—The Modern Woodmen propose to erect a society building and opera house.

New York, N. Y.—The Manhattan Storage Company will build a ten-story stor-

age warehouse at Fifty-second street and Seventh avenue, after the plans of J. E. Ware & Son. The estimated cost is \$200,000. The building will be 100x100.5 feet.

William Prescott will build an eight-story brick and stone fire-proof office building at 36 E. Twenty-second street, for which Mr. George W. Spitzer prepared the plans. The building will be 27x100 feet.

Bridges and Depots.

Albert Lea, Minn.—The Chicago, Milwaukee & St. Paul depot burned. The people of the city will ask the different railroad companies to put up a union passenger station, as it is badly needed.

Ashland, Wis.—The Northwestern has begun work on a new depot here. It will be built of brick, with Bedford stone trimmings.

Bloomington, Ind.—A stone arch bridge will be built over Spanker's Branch, on Dunn street.

Clinton, Ia.—A stone and brick arch bridge will be built at Sixth street. W. E. Russell, city clerk.

Council Bluffs, Iowa.—The Illinois Central Railway will soon let contracts for building a new depot.

Dayton, O.—A bridge, with masonry foundations and approaches, will be built across Sycamore street on the extension of Sixth street in the town of Miamisburg. O. A. G. Feight, county auditor.

Delphi, Ind.—Five small bridges, with stone arch culvers and abutments, will be built in Carroll county.

Fort William, Man.—The Canadian Pacific railway will build a new roundhouse here, of granite and brick.

Rockland, Me.—The Maine Central Railway will build a large new station here.

Salamanca, N. Y.—The Erie Railway will build a depot. C. R. Fitch, general superintendent, New York.

Waterbury, Conn.—The contract for building the abutments and central pier for the new iron bridge over the Naugatuck river has been awarded to James Geary, of New Haven, Conn.

Brick and Tile Works.

Akinsville, Mo.—Gov. L. V. Stephens, Ex-Gov. Francis, Col. C. C. Bell, of Boonville and others, have purchased the pottery works here. The buyers will establish

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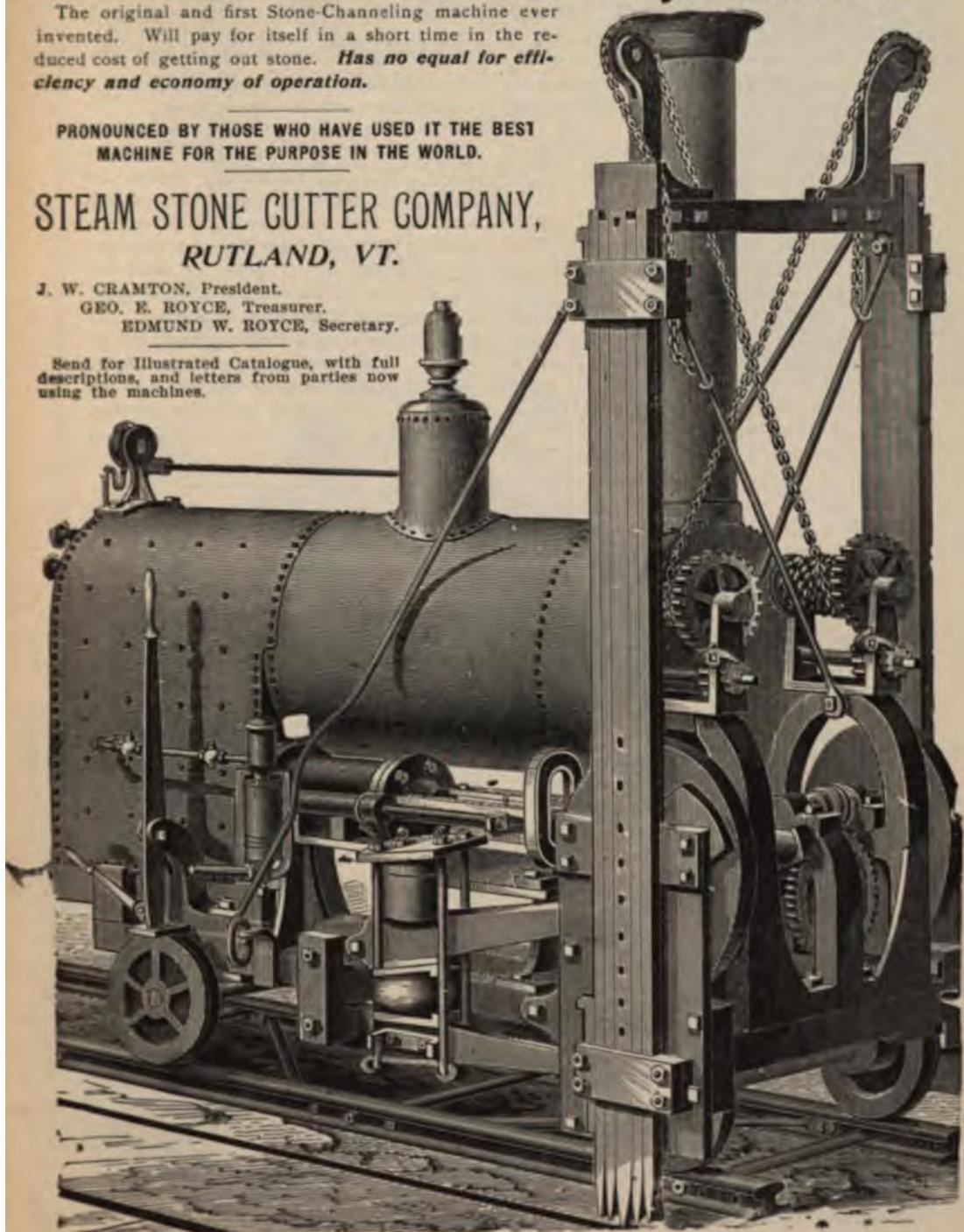
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a \$25,000 plant here and make compressed brick.

Braddock, Pa.—A new brick manufacturing plant is to be established at West Badock by Andrew G. Sheppard. The work of erecting the plant will begin at once.

Calhoun, Ga.—The brick plant, owned by J. H. Legg & Son, will be enlarged. Arrangements will be made to manufacture vitrified brick.

Chinehuba, Miss.—J. B. Fahey contemplates establishing a brick plant here.

Curry Run, Pa.—A brick plant is to be erected here.

Jersey City, N. J.—The Porcelain Face Brick Company has been incorporated with a capital of \$6,000,000. Samuel B. Lawrence, New York. James G. Young, Jersey City.

Macedonia, Ia.—Willoughby, Dyea & Co., proprietors of the Macedonia brick yard, will purchase new brick-working machinery for the winter.

Marietta, O.—The Sterling Brick Company, of Marietta, has been incorporated for the purpose of manufacturing brick for building and paving purposes, tiling and other materials made from clay or shale. The capital stock is \$30,000. F. L. Alexander, F. P. Morse, C. W. Sugen and R. D. Rood.

New Brighton, Pa.—J. H. Cooper, of Wheeling, W. Va., has purchased the Brewer Pottery in New Brighton. The plant will be fitted for the manufacture of enameled brick and tile.

Philipps, W. Va.—The Philipps Tile & Brick Company has been incorporated with a capital of \$50,000. E. K. Dye and W. D. Finn, of Mansfield; R. D. Smith, Philipps.

Victoria, Tex.—The Victoria Brick & Tile Company has been incorporated by F. B. Lauder, T. A. Heath and others. Capital, \$8,000.

can be given, nevertheless it is found that the geometrical ratio of 1, 2, 4 is by no means unfrequently employed. Symmetry also was considered as necessary in the position of their joints as in the composition of the plan, or the position of their triglyphs and mutules, and these may be observed as occupying the same place in nearly every similar construction. The Greek joint, whether it be executed in marble or in stone, is a thing really to marvel at. It is, indeed, scarcely visible. Its perfection arises from the amount of skill and labor bestowed upon it, and from the peculiar method of working the two surfaces. There are grounds for believing that there was a universal method adopted in all ages by that nation, nor was it confined to the Greeks alone, it having been handed down to and practised by the Romans also, as can be observed in the Coliseum and Arch of Septimius Severus. It, however, at length became either lost or disused.

Deep Mining in South Africa.

At a recent meeting of the South African Association of Engineers, an interesting paper, in which the southern deeps of the Rand were discussed at some length, was read by Mr. John Yates. Thirty years hence, according to Mr. Yates, these deep-deeps will be the mainstay of the mining industry—always provided, of course, there are no new discoveries of reefs or any very remarkable outcrop developments. The question of temperature is an important factor in the development of these deep-deeps. Mr. Yates mentions 12,000 feet as the limit of work by temperature, but he points out that this depth would be impossible without the most perfect ventilating appliances, and adds that even then the crowd of workers would probably make 7,000 feet the limit. At the Rand Victoria and the Victoria East the deep-deep shafts are expected to reach a depth of between 4,500 and 5,000 feet, before the reef is struck. Mr. Yates thinks that there need be no change in the present method of stoping, and he indicates that, as the cost of shaft-sinking to such enormous depths would be extremely heavy, one shaft will probably be found sufficient, the equivalent of 1,000 claims, instead of, as at present, one shaft for about 250 claims.

Greek Buildings.

The ancient Greeks were as empirical in their rule upon the proportions of each stone they employed as upon the proportions of the whole design. Thus it may be observed, for example, that the size of the stones in the Erechtheum and in the Parthenon differ in about the ratio as the one differs from the other. For the actual proportion of the stone itself no direct rule

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Rock Drill used to bore holes in granite columns, State Capitol, Albany, New York.

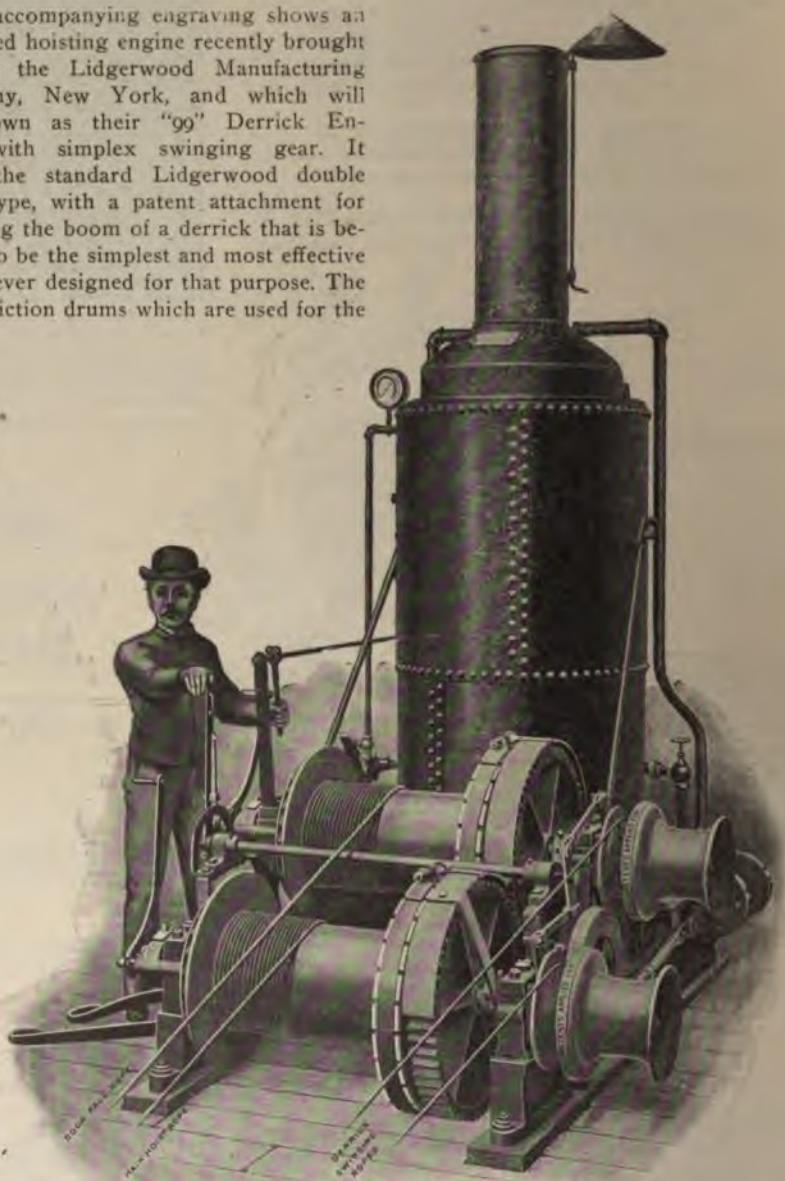
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use a Class "E" Air Compressor tacked up on the wall for driving pneumatic tools for lettering on marble and granite. It is a convenient machine for this and similar work.

Trade Notes

The accompanying engraving shows an improved hoisting engine recently brought out by the Lidgerwood Manufacturing Company, New York, and which will be known as their "99" Derrick Engine, with simplex swinging gear. It is of the standard Lidgerwood double drum type, with a patent attachment for swinging the boom of a derrick that is believed to be the simplest and most effective device ever designed for that purpose. The small friction drums which are used for the

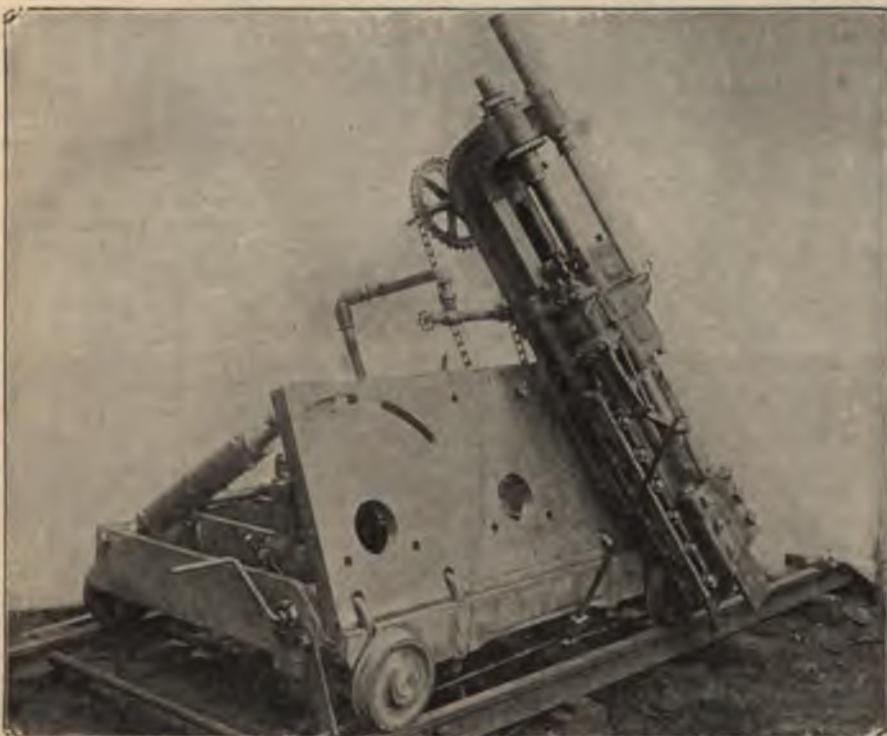


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derrick swinging ropes are placed inside the winch heads and occupy very little space, leaving the winch heads available for use the same as with an ordinary double drum engine. Both these swinging drums are actuated by a vertical lever, arranged with a detent and quadrant, so that the lever may be applied and held by the detent in its position, without further attention on the part of the operator. The device is thus easily handled by the operator, and the operations of hoisting the load, raising the boom and swinging the boom, can all go on simultaneously with practically no more trouble than in handling an ordinary double drum engine. The winch heads are secured to the shaft by a sliding key or feather, and are of special form, having a sleeve upon which the swinging drum revolves; and a very powerful form of friction is used between the swinging drum and the winch head, so that the full power of the engine can be used. The frictional contact is produced by cams placed between the swinging drums and the frame of the engine, while collars with anti-friction washers are placed on opposite sides of the frame to take up the thrust. The operating cams are connected by links to the end of a lever, which is carried on a rock shaft extending across to the side where the operator stands, and where the vertical detent lever for operating the swinging device is placed. In the operation a rope is wound on the bull wheel of the derrick, and is secured to the same in the center. Each of the two ends is secured to one of the two swinging drums, enough rope being wound on each to give the required amount of motion to the bull wheel. By throwing the lever forward it engages the friction clutch on that winch, causing it to rotate and winding in the rope which turns the boom in one direction, the other winch, meanwhile, paying out the rope, as the cams are so constructed that the same movement which engages one friction, disengages the other. By throwing the lever forward the friction of the rear rear friction drum is engaged, and the forward friction drum is released. Thus, the boom can be pulled in either direction. The cams operating the frictions are so constructed that when the operating lever is in its central position, there is enough frictional contact in the swinging

drums to keep the ropes taut, and therefore, when one swinging drum is winding in the rope, the other drum has sufficient friction to prevent the rope which is paying out from overrunning. The means of adjustment is very simple, consisting of a nut on a stud bolt in the outer end of each winch shaft. The construction of the friction is such that there is very little wear, and when the parts are worn, they may be replaced at a trifling cost, without impairing the main parts of the device whatever. The advantages of this swinging gear are apparent; it occupies a small amount of space, does not add much to the weight of the engine, can be operated with very little exertion, and requires very little time in its operation on account of the detent lever, which holds itself in whatever position placed. One of the most important features lies in the fact that it can be placed upon any of the Lidgerwood standard double drum hoisting engines, either with or without boiler. It is unquestionably one of the most valuable improvements that has ever been placed upon a hoisting engine, as it not only largely increases the capacity of a derrick, but saves the expense of swinging the boom by hand. The Lidgerwood Manufacturing Company has issued an attractive hanger, in three colors, of their "99" Derrick Engine, copies of which will be sent free upon request to their New York office, at 96 Liberty street.

Every reader of STONE who is interested in pumps should send to the E. W. Van Duzen Co., of Cincinnati, O., for Catalogue 67. This describes the celebrated Van Duzen Steam Jet Pump, which has no moving parts and is operated independently of any engine or motive power. It has no mechanical arrangement to absorb power, requires no oil, packing or special care and is therefore absolutely reliable. It is certain to start as soon as steam is turned on and will continue to work as long as steam and water are supplied. The pump is light in weight, small, portable, and can be removed quickly from place to place. It requires no special skill to put it up or take it down.

An attractive catalogue is issued by Lord, Bowler & Co., of Cleveland, O., one of the leading dealers in stone-quarrying and stone-dressing machinery in the country. The company sells the celebrated Cleveland Corliss engine in various sizes.

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also the Standard engine, which is built by the company in either upright or horizontal form as required. The company also makes various kinds of derricks, friction hoists and powers, winches, gangsaws, etc. The company has been many years in business and its high reputation is known to all readers of this magazine.

The Joseph Dixon Crucible Company has issued a little pamphlet concerning the use of the Dixon Ticonderoga Flake Graphite for cylinders and valves. The use of graphite as a lubricant is no longer in the experimental stage. It furnishes a better body for mineral oil than any of the animal oils, and at the same time it is not affected by heat.

A complete and attractive catalogue, devoted to cranes has been issued by the Brown Hoisting & Conveying Machine Company, of Cleveland, O. The catalogue is very full, extending to 175 pages, and is profusely and beautifully illustrated. It shows only the standard designs made by the company, which also makes special cranes designed for any particular work. The company are the sole patentees and builders of the Cantilever and Gantry cranes, which have found favor in all parts of the world. Besides these immense machines, all varieties of hoisting appliances are described down to light hand jib and truck cranes.

Method of Testing the Color of Building Stones.

In order to ascertain the permanence of color of building stones, Prof. W. B. Clark, chief of the Geological Survey of Maryland, tested rectangular specimens from 1 to $1\frac{1}{2}$ inch in diameter, by first drying out all the contained moisture by means of a water bath at a temperature of 212 degrees Fahr. After being allowed to cool the specimens were weighed. They were then placed upon a set of glass shelves standing in a porcelain pan containing strong hydrochloric acid. An open bottle containing nitric acid and one containing hydrochloric acid and black oxide of manganese were placed close by, and the whole covered by a bell glass, forming an airtight chamber. After a period of seven weeks the stones were removed and washed, and the change in color, if any, was noted.

Some Uses for Waste Products.

Slag from blast furnaces is now much used as a substitute for stone in concrete. It is an excellent material for this purpose, being much lighter than ordinary stone, and entirely fireproof. In the granulated form it becomes an excellent substitute for sand for cement-mortar, and in many parts of the country, where sharp bar sand is neither abundant nor cheap, it can be used advantageously. Another excellent substitute for sand for the same purpose is ordinary coal ashes, and this has been used to some extent with satisfactory results. Oyster shells make an excellent top dressing for macadam roads, making less dust than ordinary stone, and we have in the northern end of the city a road with an oyster shell top dressing subjected to heavy traffic, and giving good results.

A Conciliation Board in the English Building Trades.

The establishment of a conciliation board in connection with building trades is announced to be now an accomplished fact. It will consist of fifteen members of the National Association of Master Builders of Great Britain and Ireland and fifteen representatives from the various trade unions. The objects of the board are to adjust by conciliatory means all questions relating to the hours of labor, rates of wages and working rules, and by mediation prevent strikes and lock-outs, and assist in the settlement of disputes that may take place in the building trades.

St. Columba's Shrine.

St. Columba's shrine, with the ruins of the cathedral on the isle of Iona, has been turned over by the Duke of Argyll to the Scotch Presbyterians. He has handed it over in trust to the Established Church of Scotland, and in case the church should ever be disestablished to three civil representatives of the nation. The duke apparently thinks disestablishment is near at hand, for he names the eventful trustees in the deed.

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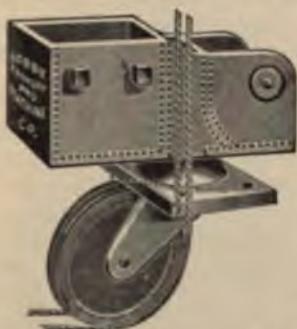
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Book Reviews.

THE GEOLOGY OF POINT REYES PENINSULA. By F. M. Anderson, Berkeley. Published by the University of California. Price, 25c.

This is one of the admirable bulletins of the Department of Geology of the University of California issued under the editorship of Prof. Andrew C. Lawson. Point Reyes is a peninsula roughly triangular in shape, about forty-five square miles in area, and lies about thirty miles north of San Francisco. It is almost completely severed from the main land and it forms a striking exception to the comparatively unbroken regularity of the shore line of the western coast of the United States south of Puget Sound. It offers a particularly interesting field for geological study, owing to the oscillatory movements that have effected the coast in Neocene and later times, the reports of which are preserved in terraces and marine deposits. The principal geological formations are granite; marble that has been used to a limited extent for making lime and is almost pure white and highly crystalline, and shales and sandstone. Too much credit cannot be given to the excellent system of geographical study which maps out limited but interesting sections of territory like this for field work and laboratory experiment.

INDIANA: DEPARTMENT OF GEOLOGY AND NATURAL RESOURCES; TWENTY-THIRD ANNUAL REPORT, 1898. W. S. Blatchley, State Geologist, Indianapolis. Wm. B. Burford, State Printer.

This is the most extended report issued by the Geological Department of Indiana. It is a volume of more than 1,700 pages and contains seven lithographic maps and more than 100 sketch maps and illustrations. In the main, it comprises the results of a careful survey of the coal area of Indiana, to which the principal energies of the department have been devoted for the past three years. It also embodies the result of the regular work by the Divisions of Mines, Mineral Gas, etc., during the calendar year 1898. The present report was planned and decided upon almost four years ago. The gradual lowering of the rock pressure throughout Indiana in the

gas field, together with the diminution of the supply of gas all about the margins of that field, were proofs sufficient that the supply of that valuable fuel for manufacturing purposes would soon end. The problem of how best to retain within the State most, if not all, of the many factories which have been erected since 1888 confronted the department. The only way the problem could be successfully solved was to show the owners of these factories that within the bounds of Indiana was a supply of fuel sufficient to last for centuries, of a quality equal almost to that of any other State. No report on the coal area of Indiana had been published since 1878. Since that time thousands of bores had been put down to prove the presence or absence of veins of workable thickness, and hundreds of shafts had been sunk to known deposits. Many valuable facts had thus become available which it was desirable should be gathered and presented in accessible form. Dr. George H. Ashley, of California, who had done much geological work in New York, Arkansas and California, and whose specialty is economic geology, especially that of coal deposits, was engaged and placed in full charge of the work. The present report, therefore, is from the pen of Dr. Ashley, who helped also to prepare many of the illustrations, and he is entitled to a large measure of credit for his work.

As far as Dr. Ashley has been able to learn, the discovery of coal in Indiana was made in 1763 by Col. Croghan, who noticed it on the Wabash River. The field notes of the surveyors who ran the township and section lines in the first decade of the present century also make report of the presence of coal. It is believed that the first coal mined in the State was by Alpha Frisbee, on Little Pigeon Creek, seven miles east of Newburg. An advertisement of coal for sale appeared in 1832. In 1812, when Robert Fulton made his first trip down the Ohio in the "Orleans," he stopped at Fulton, near Cannelton, Perry County, and obtained some coal. As early as 1840 coal was being regularly mined at many places throughout the State, in most cases only for blacksmiths' use, but in many instances for shipment. The first charter granted by the Legislature for the mining of coal was in 1837. From 1852 mining operations on a large scale began to develop rapidly, until in 1879 laws were



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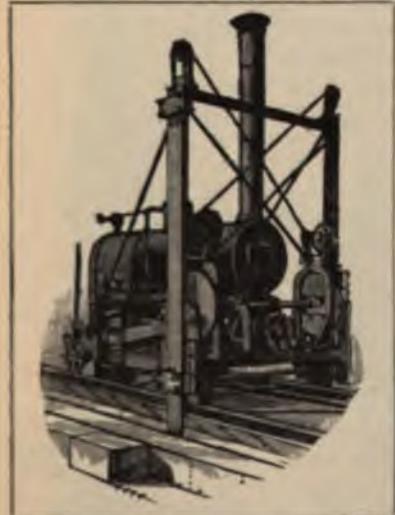
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passed for the regulation of the mines and a mining inspector was appointed. At this time the output of the State was over 1,000,000 tons, and a like number of dollars were invested in mining property. In 1886 Indiana, with a production of 2,000,000 tons, stood seventh among the coal producing States of the Union. In 1896 the State stood eighth, with a production of 4,068,124 tons, and an invested capital estimated at \$1,750,000.

So much for the general character of the report. Dr. Ashley has taken up in detail every section of the State where coal is known to occur, giving statistics of production and treating of the geography and stratigraphy of the various regions. The volume is one of the most complete, exhaustive and creditable reports devoted to a single branch of economic geology that has been produced by any of the States. It is an admirable addition to the splendid list of volumes put forth by the Department of Geology of Indiana.

**GEOLOGICAL SURVEY OF OHIO,
VOLUME 7, PART I.** Edward Orton, State Geologist, Norwalk, O. The Lansing Printing Co., State Printers.

The first part of the seventh volume of the Ohio Geological Survey is devoted in general to the iron and clay of that State. Chapter 1 is by that veteran scientist, Prof. Orton himself. It is devoted to the geological scale and the geological structure of Ohio. This is a brief review of the geological column of the State summarizing the facts that have been presented before in order that the volume may be properly understood by everyone without reference to its predecessors. Prof. Orton also writes the second chapter on the clays of Ohio, their origin, composition, and varieties, and this is followed by another making up the main portion of the book, which is a thorough and careful review of "The Clay Working Industries of Ohio," written by Edward Orton, Jr. The manufacture of clayware in the State has grown to a very remarkable extent during the past decade and it probably ranks next to the mining of coal among the industries depending upon the natural mineral resources of the State. From the statistics in this chapter it is learned that there are three large factories in the State devoted to the production of common earthenware, employing 165 hands. In the production of stoneware

there are, including the small potteries, 133 kilns, employing 100 men, with an annual capacity in gallons of 24,350,000. There are thirty-three kilns producing yellow and Rockingham wares; seven firms, with twenty-seven kilns, producing C. C. ware; twenty-four firms producing white granite pottery, with 127 burning kilns, and fifty-two decorating kilns, while two firms, with eight kilns, produce china. In the manufacture of paving bricks there are forty-four factories, with 357 kilns and an annual production of 292,300,000. Ohio ranks first among the producers of sewer pipe, there being thirty-five factories with 529 kilns. The final chapter in the book is on the coal fields of the State and is written by Prof. Orton. The entire volume is well up to the high average maintained by the Ohio reports.

GEOLOGY OF OLD HAMPSHIRE COUNTY, MASS., COMPRISING FRANKLIN, HAMPDEN AND HAMPSHIRE COUNTIES. By Benjamin Kendall Emerson. Washington, Government Printing Office.

This monograph forms Vol. XXIX. in the Nineteenth Annual Report of the United States Geological Survey, Charles D. Walcott, director. It is a very complete and valuable geological description of the three counties in Massachusetts through which the Connecticut River runs and which include nearly the whole of that portion of its drainage area which lies within the limit of the State. The studies for the work began in 1873 and the results were offered to the United States Geological Survey in 1887 and were accepted at that time. A small portion of the area has since been re-examined and the map has been extended a little beyond the limits of the State north and south to cover the whole of the area presented in the topographical sheets employed. Old Hampshire County, which formerly stretched across the State of Massachusetts between Berkshire on the West and Worcester on the east, has been less fortunate than these and has lost Franklin County on the north and Hampden on the south. Amherst lies in the center of this area and as Prof. Emerson occupies the chair of Geology in Amherst College it is only natural that this should be the chosen field of his geological studies. The area under consideration pos-

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seses a good degree of geological unity, the Cambrian gneiss of its eastern and western boundaries being almost certainly continuous beneath the lower area and supporting several series of schistose rocks, which culminate in the Bernardston highly metamorphosed but fossiliferous beds of Devonian age. The area also includes the northern half of the Triassic terrane and the sandstone and trap ranges from Mount Tom, southward. The importance of this area on the economic side will be recognized when it is remembered that it includes some of the very best of the granite deposits of the State, the entire section that produces the famous Connecticut River standstone, familiarly known as Longmeadow stone, as well as one of the very best deposits of emery found in the country. Since systematic efforts were first made toward the study of North America geology, the triassic rocks of Connecticut have always had a certain fascination for the scientists, and the names of such authorities as Dr. David Hun, President Hitchcock, Prof. Amos Eaton, Dr. George Gibbs and Prof. Chester Dewey, are associated to a certain degree with this field. But it has remained for Prof. Emerson to go into full detail on the subject and to give a thoroughly adequate presentation. His monograph, which extends to nearly 800 pages, is accompanied by many maps and illustrations, and is an admirable example of careful, conscientious and scholarly geological investigation. It is well worthy of a place in the monumental series of the United States Geological Survey.

GEOLOGICAL SURVEY OF MICHIGAN, VOLUME VI. Lucius L. Hubbard, State Geologist, Lansing, Mich. Robert Smith Printing Co., State Printers.

This volume is made up of two parts. The first is a geological report on Isle Royale, by Alfred C. Lane, Assistant State Geologist. This is accompanied by sixteen plates and twenty-nine figures. The second part is "Keweenaw Point, With Particular Reference to the Felsites and Their Associated Rocks," by Lucius L. Hubbard, accompanied by ten plates and eleven figures. As an appendix to the second part is given "The Crystallization of the Calcite from the Copper Mines of Lake Superior," by Charles Palache, accompanied by six plates. The volume is an ad-

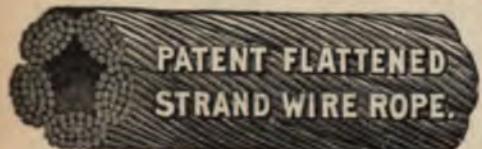
mirable example of careful, conscientious and scientific work and will be welcomed as an invaluable contribution to the geological history of the country. When Michigan has finished the scientific presentation of its geology it is to be hoped that the economic features will be treated in the same thorough and careful manner.

Bricks and Mediaeval Masonry.

County councils are compelled to think of utility before archaeology, says the "Architect and Contract Reporter," of London. Accordingly, when Swarkestone bridge exhibited weakness the Derbyshire county council had seven of the arches relined with blue bricks, regardless of the contrast with the mediaeval masonry. Six gothic arches remain, and as they are in a safer condition it has been decided to allow them to remain as they are, for the present at least. Mr. C. J. Ferguson, of Carlisle, suggests that old bridges may be secured with the aid of concrete without exhibiting any signs of vandalism. In a letter to the "Times" he says: "An examination of the Roman method of building after the time of the republic shows that the great concrete vaults of the baths and other buildings then erected were formed to a great extent on permanent centering of tiles. That permanent centering still remains and forms with the concrete which overlaid it a complete vault. In like manner, if the upper surface of the stone arches of any defective freestone bridge is laid bare and skilfully overlaid with concrete of sufficient quality and thickness, the soakage from the matrix of the concrete will so permeate the defective stonework of the arch as to unite stone and concrete together into one complete vault. In this way the strength of the bridge can be increased to any reasonable extent according to the thickness and quality of the concrete. The haunches of the arches are solidly filled up and the stonework is protected from its greatest damage—the constant soakage into it of surface water." In cases where bridges suffer from settlements in the foundations, and they are numerous, working from above would be ineffectual, for the additional weight would increase the weakness of the substructure; but cases arise when Mr. Ferguson's suggestion could be utilized with advantage.

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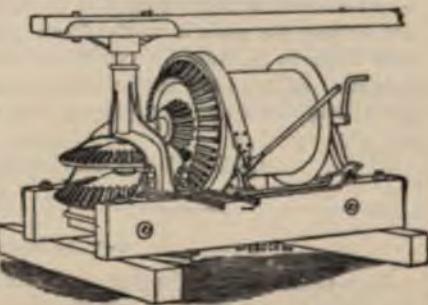
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Cleveland, O., Oct. 3, 1899.

There is little to report from here that would be of interest to readers of STONE. Considerable building is now going on and there has been activity all summer, but not a single stone job has come out, save trimmings for brick work. Consequently it can be seen what a poor season it has been for stone cutters, as there has not been a day during the entire summer but one could find some of our men idle. At present writing our trade is on the down grade and there is nothing in sight for this autumn. All we have left to hope for is a good bright spring with plenty of work for all.

D. GWILYD GEORGE.

—
Peoria, Ill., Oct. 13, 1899.

I am pleased to report that the building enterprise in our city goes steadily on, giving employment to all the home talent as well as to many outsiders. Carpenters and bricklayers are in demand and common labor finds a ready market, a good indication of prosperity. There is considerable in the way of city improvement going on. A new gas company has started doing business here and is laying about twenty-six miles of underground pipes. The Kingman Plow Company will soon be in operation, as its factory is about completed. It is the intention of the company to build from twenty-five to thirty dwelling houses for its employees. Work on the asylum building is progressing rapidly. When it is completed there will be accommodations for 5,000 inmates, including the managing force. The railroad companies are keeping up with the times, for the T. P. & W. are remodeling their station, while the C. R. I. & P. are building a brand new one. Today, Gov. Tanner was here and had the first ride over a new line connecting this city and Pekin, Ill., a distance of ten miles, making connections at the asylum. The line was built by the Traction Company. On the 6th, President McKinley paid the

city a visit and, during his stay, dedicated the beautiful soldiers' monument, which has cost \$30,000.

SCALLY.

Excavations at Silchester.

Through systematic excavation, extending over many years, the 100 acres enclosed within the walls of the ancient Romano-British city at Silchester have yielded a large crop of objects of great antiquarian value, which form quite an imposing collection in the Reading Museum, says an English exchange. The division of the areas for exploration each year takes the lines of the ancient streets, as indicated by the difference in the color of the crops which are cultivated on the spot, and already a little over half the site has been dug out, relieved of its treasures, and restored to cultivation after the foundations of the ancient buildings have been carefully planned and photographed. The results of last year's explorations have been exhibited in the apartments of the Society of Antiquaries at Burlington House. The evidence they afford confirms the view already accepted that the site was occupied by a civil population and not by military. In addition to minor buildings, a large, well-planned house of early date, several fine hypocausts, and a workshop have been unearthed, as well as a number of wells and pits, one of the latter having a double row of wooden stakes driven into the bottom, probably for the impaling of wild animals. The remains of an earlier house were found beneath the large one, with a rare mosaic pavement sufficiently intact to permit of huge slabs being pieced together and placed on exhibition. It was contrary to ancient government that human bones should be interred within the walls of a city, but evidently the modern invader of by-laws and regulations had his prototype in remote days, since in a secret, out-of-the-way corner, some feet below the surface, has been found a jar full of calcined human bones. For the sum of £4,300 already spent upon them the excavations have given ample results, and it is hoped that the £3,000 still required by the exploration fund will be forthcoming in order that the work may be satisfactorily completed.



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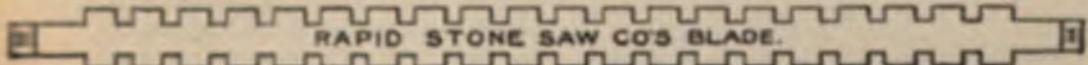
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Mining in Greece in 1898.

Mining and metallurgy were pretty fair in Greece during the year 1898, although the course of exchange sank below that of 1897. As a compensation, the ores fetched better prices, and the re-establishment of a sounder financial basis is bearing fruit. Mining and metallurgical enterprise are still confined to the small islands and to the coast, where no great transport difficulties have to be overcome. The interior is, so far, not promising enough to justify expensive roadbuilding, but the government is encouraging mining enterprise. During the years 1882 to 1891 no concessions had been granted at all. Between 1891 and November, 1898, the number of concessions granted amounted to five. During the first months of this year that number rose to 36, so that the interest is decidedly growing. The ore production of last year was satisfactory, relatively speaking, of course. Iron heads the list with 287,000 tons, then come manganiferous iron ores 213,000 tons, further manganese ores 14,000, blonde 1,000, calamine 30,000, magnetite 35,000, emery 4,000, sea salt 25,000, lignite 17,000, mill-stones 18,000, puzzolane 71,000, argentiferous lead 19,000 tons. The lignite, plaster, talc (French chalk), lead, remain in the country, most of the salt too; the bulk of the other products goes abroad. Almost all the figures for 1898 are better than those of 1897; blonde and lignite are exceptions. Manganese ores are frequent, but generally poor; the best and only important mines are on the island of Milo, where the ore occurs in tertiary tuffas. That the famous emery mines in Nasos do not pay well would appear to be the fault of bad management.

The Arch Principle in Dams.

The application of the arch principle to dams is of comparatively recent date, for though some old structures have curved outlines, convex on the upstream side, they were so made for the sake of appearance and cannot rightfully be called arch dams. The arch dam proper is virtually a masonry arch with which the pressure of the water, impounded on the convex side, takes the place of the load, but the weight of the masonry does not add to the load as in the case of the railway arch. Like the railway arch, however, the load on the arch dam

is resolved into a lateral thrust transmitted to the abutments on the banks of the river. It is, however, difficult to determine with any degree of accuracy the magnitude of the reaction at the abutments, as the weight of the masonry and the adherence of the structure to the foundations introduce disturbing influences and a large part of the water thrust is absorbed in overcoming these dissatisfaction.

Considerations of cost limit the use of the arch dam to small spans. A narrow river bed bounded by steep, rocky embankments is especially adapted for this type, and engineers have not been slow to take advantage of such natural inducements in some parts of the world.

In the mountainous regions of California, where many rivers utilized for water power and water supply purposes rush down narrow gorges bounded by precipitous cliffs, the conditions are most favorable for the arch dam, and many of the boldest structures of this kind may be seen in that beautiful country. Perhaps the most famous is the Sweetwater dam, 90 feet in height and 340 feet long, a narrow wall, bending upstream in a graceful curve, the slender outlines of which cause feelings of distrust in the non-technical observer as to its competency to perform the steady and unremitting duty of holding back the waters of the river, for it has been well and truly said that an arch never sleeps, an aphorism which might be applied to arch dams where the water never fails.—Robert S. Ball, Jr., in *Cassier's Magazine* for November.

Limestone in South Dakota.

Experiments have been made recently with samples of limestone outcropping found on the farm of W. H. Morgan, close to Westport, S. D., which show that he has a very valuable deposit of the stone if it is found to exist in sufficient quantity, says in "Improvement Bulletin." Samples of the stone were brought to Aberdeen and lime of very fine quality has been produced. Samples of the stone have also been dressed and polished and the result has been altogether satisfactory. Judge Morgan will shortly have an examination made to ascertain if the stone exists in sufficient quantity to be of commercial value, and if there is enough of it to warrant will arrange for quarrying it for building stone and for the manufacture of lime.

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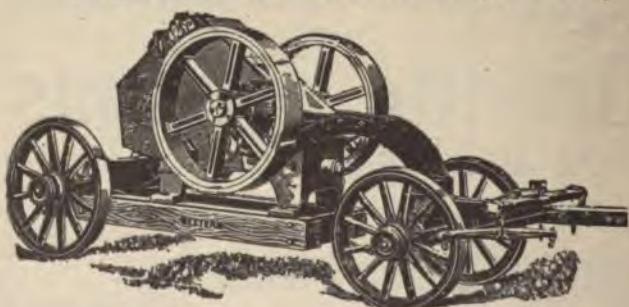
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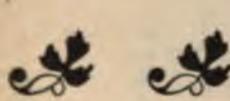
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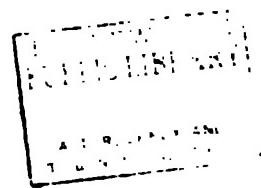
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NUMBER 6.

THE VERMONT MARBLE COMPANY AND THE VILLAGE OF PROCTOR.

NO other name is so closely identified with the marble industry of this country as that of Hon. Redfield Proctor. For more than a quarter of a century Senator Proctor has been actively engaged in developing the marble industries of his State, and the company that he founded, the Vermont Marble Co., from a small beginning has grown to be by far the largest producer of marble in the world. The marble deposits of Vermont were known to the earliest settlers, but they were not worked to any extent until about the time of the Civil War. When Colonel Proctor returned from the war, he settled in Rutland and resumed the practice of law. In 1869 he was appointed the receiver of Dorr & Myers, who at that time were operating a small mill with ten gangs of saws. They had no quarry of their own, but obtained marble blocks from the Sutherland Falls Marble Company, which was incorporated under the laws of Massachusetts. As soon as he had mastered the details of the business, Senator Proctor determined that a splendid field was to be found in this industry under wise and energetic management. He therefore purchased the plants of the saw mill and the Sutherland company and combined them into one organization, incorporated under the laws of Vermont as the Sutherland Falls Marble Company. This was in 1870. Ten years later Gov. Proctor became president of the Rutland Marble Company of West and Center Rutland, and at once consolidated that company and the Sutherland Falls Marble Company of Proctor, under the name of the Vermont Marble Company, of which he became president and manager. Since that time the company has purchased and added to its business the plant of Gillson & Woodfin, of West Rutland, in 1888; of Ripley Sons, at Center Rutland, in 1889, and of the Sheldon Marble Company, at West Rutland, in 1896. This last property the Vermont Marble Company had previously operated for several years under a long lease. The growth of this business has been perhaps the most



THE SUTHERLAND FALLS QUARRY AT PROCTOR.

striking feature in the entire history of the stone industry of the United States. Senator Proctor began the marble business by operating a single quarry and a mill of ten gangs and with not to exceed 75 men. Now the mills of the company cover an enormous territory and contain over 300 gangs of saws, while there are extensive shops for cutting and polishing marble. The company is also operating more than one dozen quarries and it produces 1,000 carloads of marble every year. Its various employees amount to about 2,000 and their pay rolls aggregate almost a million of dollars. It possesses marble properties in many towns, and the scattered mills and quarries are connected by a steam railroad owned by the company. The product of these celebrated quarries is shipped to all parts of the world, and it has branches in all of the leading cities of the country, where mills and shops are also operated.

The main office of the company and the center of its great business is in the village of Proctor, Vt., the development of which has kept pace with the growth of the marble business. The largest single quarry of the company is located here, and it has developed and made use of one of the most remarkable water powers in the entire State. The fall of 122 feet in Otter Creek, known as Sutherland Falls, furnishes about 3,000 horse power, not only enabling the shops at Proctor to saw and finish the marble produced there, but also furnishes power to the other quarries. The quarry at Proctor is run by electricity generated by water power. The most extensive quarries of the

THE MILL IN 1870





PORTIONS OF THE MILLS AND YARD AT PROCTOR.

company at any one place are its West Rutland quarries. They furnish a pure white marble which is finely adapted for monumental and decorative uses. At Center Rutland the company has two large water powers and extensive mills and shops for sawing and finishing marble.

The village of Proctor is essentially a marble town. It has been built up by the industry, and the life of the village centers around it. There are, however, excellent farming lands surrounding the town, and in the village itself improvements have been made with enterprise and liberality. It is very picturesquely situated, as Otter Creek is confined within narrow limits and the hills on either side are high. It has never been the policy of the company to acquire or retain ownership of residential or other property in the village, not immediately connected with its business, but for the convenience of its employees it is required to own a large number of tenements in all of the places where its business centers. Those at Proctor are well built and constructed and are as largely as possible single houses. The company has also encouraged its employees to build and own their own houses, and when necessary it has advanced and carried loans for this purpose. It speaks well for the character of the company and its employees that no property of this kind has come back for debt. Senator Proctor himself lives in the village and has a most attractive home, and his son, Fletcher D. Proctor, who now manages the affairs of the company, also has a beautiful home in the village.

The company has built and equipped a modern hospital, which was opened for the admittance of patients in August, 1896. A view of this building is presented. In 1895 the company began to employ trained nurses at Proctor and West Rutland to attend cases of sickness among its employees

and their families. The hospital has accommodation for ten patients and even more in the case of emergency. It is built after the most modern plans and is perfectly equipped. The charge for an employee or a member of his family is limited to \$4 a week, but a large proportion of them are admitted free and are given medical attention without charge. There will also be found accompanying this article a picture of the attractive little public library, which is built of stone with a marble front. This contains a very fine reading room and museum and has several thousand volumes. Senator Proctor has a standing offer to contribute as large a sum for new books as the association can raise from other sources. The high school, which also contains a village hall, is shown in another illustration.

That Vermont marble is known all over the world goes without saying. The three varieties produced by the Vermont Marble Company are known to the trade as Sutherland Falls, Rutland White and Blue Marble. The Sutherland Falls is very strong and durable, close grained, and does not absorb the impurities of the atmosphere. It is slightly clouded and variegated. This is especially adapted for buildings requiring large pieces, owing to the ability of the company to produce blocks of almost any size from the quarry. An



QUARRY AT WEST RUTLAND.

analysis of the Sutherland marble made by Prof. E. P. Harris, of Amherst College, is as follows:

Carbon dioxide	43.75
Calcium oxide	54.72
Magnesium oxide .....	.89
Silicate of aluminum .....	.54

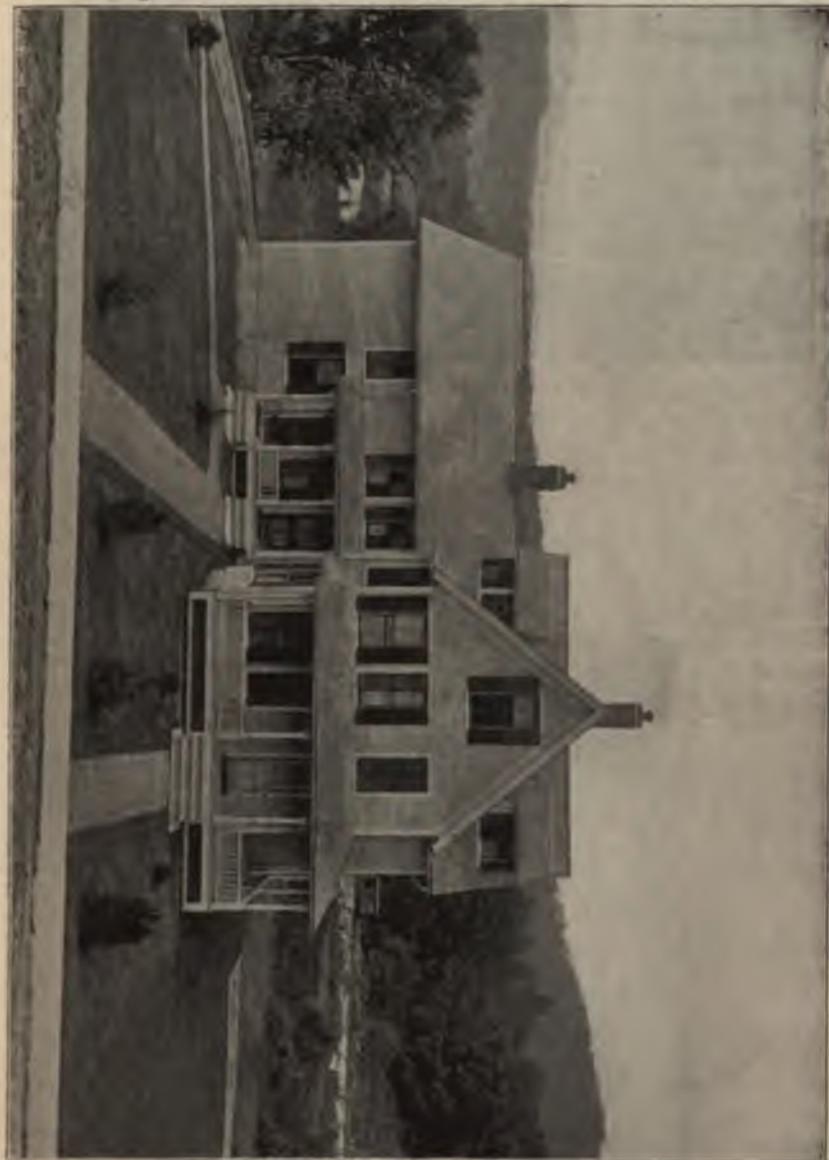


VILLAGE HALL AND HIGH SCHOOL AT PROCTOR.

This stone has been used for a number of notable buildings in different parts of the country, including the spire of Grace Church, New York; the Church of the Ascension, New York; United States post offices and court houses at Worcester and Montpelier; the Second National Bank, Paterson, N. J., and Clio Hall, at Princeton College.

The Rutland marble, so called, is produced only at West Rutland, Vt., the quarries being owned by the Vermont Marble Company. The white Rutland is of fine and even grain, and from the same deposit are obtained the noted fancy green marbles and the Rutland blue. The chemical properties of the Rutland marbles are as follows:

	White.	White with green stripe or clouded.	Blue.
Carbon dioxide	43.80	42.25	44.00
Calcium oxide	54.95	53.30	55.15
Magnesium oxide .....	.59	.38	.57
Silicate of aluminum.....	.62	4.03	.22
Silicate of magnesium.....	.62	4.03	.22
Silicate of iron .....	...	4.03	.22
Carbonaceous matter .....	...	...	.05



PROCTOR HOSPITAL.



PROCTOR PUBLIC LIBRARY.



INCLINED RAILWAY AT THE SHELDON QUARRY.

The Rutland white has been used for many fine buildings, including the Metropolitan Club, New York; the Hart Memorial Library, at Troy; the Hotel Regent, Brooklyn, N. Y., and the residence of C. Oliver Iselin, at New Rochelle. Some of the fancy variegated marbles produced by the company are named Verdozo, Rubio, Brocadillo, Dove Blue, Olive and Listavena. The Listavena has been largely used in the Stock Exchange, Chicago, and the Yerkes Observatory at Lake Geneva, Wis. The Verdozo has been used to a good effect in the Bowling Green Building, New York, while the Brocadillo can be seen in the Baldwin Hotel, at San Francisco, and the Columbia Bank, Pittsburg. These are only a very few instances of the use of the Vermont Marble Company's products, as the stone has been used to a greater or less extent in almost all of the notable buildings of the country. How widely it has been used for the highest class of monumental work it is needless to tell.

Among the illustrations that we present are one of the old Sutherland Falls mills, as it appeared in 1870, from which this vast business, the marvel of the entire stone trade, has grown. We also present a bird's-eye view of one portion of the mills and yard of the company at Proctor, Vt. This does not include half of the property, as both mills and yard cover more than double the area shown.

It goes without saying, in view of the phenomenal growth of the company, that it has been managed in an enterprising and progressive manner. All of its equipments are modern and of the best type and its treatment of its employees is such as to secure from them all loyalty and devotion to its interest.

MARCUS GARDINER.



THE OCCURRENCE AND USES OF MICA.



PERHAPS no other mineral is so likely to attract one's attention in the field as mica. Its glistening cleavage plates catch and reflect the rays of the sun, causing the mineral to stand out like a blazing light upon the darker background of the surrounding rock, its sparkling reflection even being caught from the dull gray sides of hills and mountains miles away. No wonder it attracted the attention and aroused the superstition of the aborigines, giving rise to strange legends of its wonderful and supernatural properties. The beautiful legend of the Great Carbuncle, made familiar to all of us by the pen of Hawthorne, in all probability had its origin in the bright reflection of a huge mica plate.

No mineral could appeal more strongly to the savage or semi-civilized taste for finery, and it is but natural that it should have been mined for ornament centuries before the advent of the white race upon this continent. Mica ornaments were early discovered in the earthworks of the Mound Builders in our Central States, works so old that even among the Indians no tradition as to their origin was extant.

The mines from which the mica was obtained were hundreds of miles away among the mountains of North Carolina. But notwithstanding the considerable distance from their place of habitation, these mines were extensively worked by the Mound Builders, who sank shafts and ran tunnels until the rock was often completely honeycombed with their workings, and great heaps of excavated material had accumulated at the entrances.

Although it was only in North Carolina that mica was mined to any extent by the Mound Builders, the mineral is one which has a wide distribution. It is a common constituent of nearly all of the older rocks, both sedimentary and crystalline, and is represented in nearly every State and Territory in the country. It is most widely known as a component mineral of our common granites and schists, but because of the smallness of the grains, neither of these rocks are a source of commercial mica. This is obtained solely from a peculiar kind of rock known commonly as *giant granite*, so named from the gigantic size its component minerals have taken on crystallizing. In this giant granite occur, in cases, feldspar crystals up to twenty feet in diameter, beryl crystals three feet across, spodumene crystals forty feet in length, quartz masses fifty feet thick and mica crystals from three to four feet in diameter. A plate of mica of even greater size is said to have been taken from the old Ruggles mine at Grafton, N. H. It was five feet in length and three feet in width, and was sent to Windsor Castle, England. A single block of mica from North Carolina is described as making two two-horse loads.

The giant granite occurs mostly in the oldest of known rocks, the Archean of geologists, but is sometimes found in younger rocks where these have been subjected to igneous or mountain building forces. As we should expect, therefore, the giant granite is confined mostly to mountainous re-

gions, partly because they are the seat of mountain building forces, and partly because it is here that erosion has been greatest, and consequently the oldest rocks exposed. As a rule, the giant granite is most abundant where these mountain building forces culminated, especially if the action took place in early geological times. Thus in the eastern portion of our country the mountains reach their maximum development in North Carolina in the South and in New Hampshire in the North, and it is in these States that we find the giant granite most extensively developed.

The giant granite occurs in the form of dikes, and in great lenses or irregular masses (bosses). The dikes and bosses usually have little or no relation as to direction with the structure of the inclosing rock, but the lenses lie between and parallel to the inclosing strata. The origin, however, is the same in each case. The giant granite is essentially igneous in character, having cooled from a molten state while at great depths below the surface existing at the time of their formation. This great depth, taken in connection with the presence of water, both of which have been proved to retard the solidification of molten rock, served to prolong greatly the process of crystallization, giving the crystals ample time to acquire their great and unusual size.

The giant granite occurs in rocks of widely different natures, including common granite, various kinds of schists and gneisses, in limestone, and in fact, in almost every igneous or metamorphic rock with which we are familiar. Notwithstanding the great variety of rocks in which the giant granite occurs, it is almost never affected by the composition of the inclosing rock, showing that very little of the latter was dissolved by the molten granite. In case of certain schists, however, this does not hold good, for the granite has dissolved large amounts and actually eaten its passage through them. In such cases it follows of necessity that the composition of the giant granite would have been affected. We find that in reality the granite does contain more mica when it is in schists than when it is in granite, which would be the result that we should expect from the chemical composition of the dissolved schists.

The mica of the giant granite occurs in a great variety of ways and no rule can be given that will hold good for every locality. Sometimes it occurs as small plates two or three inches in diameter distributed uniformly throughout the mass of the granite; sometimes it is most abundant near the hanging wall, at others it is most common along the foot wall; sometimes it occurs mainly with the feldspar, at others mostly in the quartz. In many of the narrower dikes the tabular mica crystals occur with the longer axes perpendicular to the walls, but this is by no means universally the case. Often it is found as great bunches or strings of interlocking plates, or even gnarled or concentric masses having no apparent relation to any external feature. Indeed, beyond the fact already mentioned that the mica is likely to be most abundant when the giant granite is inclosed by schist, little can be said that would have general application, though certain features are sometimes quite persistent in given localities and may be of value in local application.

Mica is present in giant granite in two forms, a black mica known as

biotite, and a light colored mica known as muscovite. The latter variety, which alone is of commercial value, is usually of a light brownish color, but green, yellow, and rose varieties have been observed. In size its crystals range from half an inch to three feet or more in diameter, the smaller sizes predominating and furnishing almost the whole of the marketable product.

The waste in cutting is very great, the finished product seldom amounting to more than ten per cent. of the product amount in the rough. It consequently commands a good price, varying from fifty cents to \$30 a pound according to the size of the plates. The trimmings were formerly regarded as waste, but much of it is now ground and sold in the powdered form.

Among the properties of mica which detract from its value is its possession, in certain localities, of a secondary cleavage due to the immense pressure to which it was subjected while yet deeply buried in the earth's crust. This cleavage is perpendicular to the ordinary cleavage, often dividing what otherwise might have been a perfect sheet into narrow strips, or even into needles and fibers.

The chief use of mica arises from the fact that it is a non-conductor of electricity, which makes it of great value as an insulator in electric appliances. The demand for mica for this purpose is great and ever increasing and insures good prices for some time to come unless some other and cheaper substitute is discovered. A more familiar use of mica is its employment in the doors of stoves and for lamp chimneys for Welsbach burners, its value for these purposes depending upon its power to withstand a high degree of heat without loss of transparency and toughness. In reality, however, the mica does undergo a slow change when subjected to the high heat of a stove, gradually becoming darker and less coherent until it finally crumbles to pieces.

In its powdered form the mica is used to produce the sparkling appearance in the snow scenes on Christmas cards and for producing a silvery spangle in wall papers and fabrics.

M. L. FULLER.



MEANS OF DETERMINING THE ECONOMIC VALUE OF STONE.

II.—THE BUILDING STONES OF WISCONSIN.

LAST month STONE printed an article dealing with the color and decay of stone, taken from a bulletin on the "Building Stone of Wisconsin," by Prof. Ernest Robinson Buckley. Another chapter in this very interesting report deals with "Means of determining the value of a stone for building or other economic purposes." As to quarry observations, Prof. Buckley says:

"Many important conclusions may result from quarry observations which cannot be reached through an examination of selected samples. Samples, which are exhibited by quarry owners, are generally taken from the best stock, and often give little idea of the general run of the stone as it occurs in the quarry. The stone often varies quite largely in different parts of the same quarry. The color may be solid and uniform in one part and variegated in another. Certain beds may be uniformly free from lamination, while those immediately above or below may be distinctly bedded or laminated. There are zones in certain quarries that are characterized by numerous incipient jointing planes, which are noticeable only on the weathered surface. Buildings of long standing may reveal certain of these defects in the stone, but if care has been exercised in selecting the stone, the walls may show no sign of deterioration. The quarry itself is the only place to observe the uniformity of the stone.

"The quarry is not only the best place to ascertain the uniformity in color and texture of the rock, but it is also a favorable place to note the permanence in color and the durability of the stone. In the quarry the stone may be examined in its fresh state and contrasted with that of the natural outcrop, which has been subjected, through many years, to the vicissitudes of a changing climate. From these observations one may make comparative estimates of the rapidity with which the rock weathers. Such estimates will, necessarily, be of the most general nature, because no two rocks are subject to precisely the same climatic conditions.

"The depth to which disintegration has gone depends less upon the inherent characteristics of a rock than upon its position, with respect to the general level of the country, the climatic conditions and the length of time through which it has been subjected to weathering action. Under certain definite conditions the rapidity of rock weathering will depend upon the inherent characteristics of the rock. Under different conditions the result may be wholly different. For example, one rock may be so constituted as to suffer more from the extremes of temperature than another, while percolating water may affect the latter more than the former. The same rock under different climatic conditions may in one case show discoloration and in another retain its original color. Under the same conditions one rock may discolor and

another remain unchanged. One rock may be affected by organic or other acids, while another will remain uninjured thereby. Thus, as has been previously explained, the cause of decay may be inherent in the rock itself or a result of external conditions.

"The depth of disintegration of rocks naturally elevated above the surrounding country is generally less than those in the low, level portions. This is partially to be attributed to the greater rapidity with which disintegrated material is removed from the hills than from the valleys. Yet it must be borne in mind that rock weathers less rapidly when it is protected by a mantle of alluvium, as is usually the case in valley plains. In the lower level areas the product of weathering is cumulative, while that of the sloping and more elevated areas remains almost constant.

"Further, we must not lose sight of the fact that the disintegration of a very durable rock, through a long period of years may be greater than that of an easily decomposed rock which has suffered but a few years of exposure. This difference in amount of disintegration is nicely illustrated in a comparison of the rocks of the southern non-glaciated and the northern glaciated regions. The rocks of the glaciated region are less disintegrated than those of the non-glaciated, mainly because they have been subjected to weathering for a much shorter period of time.

"There are two additional reasons for the slow disintegration of the rocks of the glaciated region, which must not be overlooked. (1) In many places the rocks have been smoothed and polished, thereby facilitating the passage of the water off from their surfaces. (2) The glacial deposits in many places cover the rocks with a protecting mantle of boulder clay or till. After taking into consideration these two factors, the comparative durability of the different rocks in the glaciated region can be approximately estimated by the depth of the weathering or disintegration.

"In the glaciated region disintegration is generally not far enough advanced to furnish any considerable amount of material for transportation by the rivers. Those rocks of the glaciated region, which have been exposed to weathering processes since the recession of the glaciers, thousands of years ago, show clearly any inequalities of texture in the rock. Under a mantle of débris these differences of texture would fail to appear, even after a much longer period. Under present conditions, the partially weathered surface brings out with exceptional clearness any inequalities in the hardness or texture of the rock. On the weathered surface the hard parts of the rock generally stand out in relief, while the softer parts are indicated by depressions. Incipient jointing and sedimentary planes can be most readily detected on the weathered surface of a rock. If such a surface shows these structural planes, it is quite certain that they extend into the quarry for some depth, although often invisible. Stone from a considerable depth below the surface, which shows no special structures, when first quarried, may after exposure to the weather for many years, develop fine jointing or sedimentary planes, similar to those observed in the natural exposure. The fact that prominent joints or fissile planes at the surface become so close that they cannot be detected at a depth of several feet, has led to the current belief, among quarrymen, that

joints disappear with depth. Although this is certainly true when applied to considerable depths, the general application of the rule has led to very erroneous conclusions. As a rule, the joints do not disappear at the depth to which quarrying is ordinarily carried.

"Soft spots, pebbles, fossils and similar irregularities in texture are revealed by weathering. By careful quarry observations and conservative judgment one may estimate the possible injury from such sources.

"In some cases weathering reveals and in others it conceals the presence of injurious constituents. Pyrite or marcasite may be cited as impurities which weathering often conceals. These constituents may often be detected by discolorations on the surface of the stone, but if weathering has proceeded to a considerable depth direct evidence of their former presence may be completely removed. If quarrying proceeds beyond the zone of weathering the minerals will be found in the rocks in their unaltered state. Weathering may cause bleaching, as well as discoloration. Efflorescence and incrustation frequently occur on the weathered surface of limestone. All of these tendencies may best be detected in the natural exposure.

"In glaciated areas the hardness may be roughly estimated by observing the polished or grooved surface of the rock in the quarry. Deep grooves often indicate a comparatively soft stone, while less conspicuous markings, or entire freedom from them, may indicate a hard stone. The clearness and distinctness of the grooves are evidence of durability. In making estimates from such evidence it is quite necessary that the character of the stone, its position, and other factors be considered. The presence of lichens growing on the face of an exposed cliff has been thought by some to be indicative of hardness and durability. Unfortunately, this criterion of hardness, when taken alone, has little significance. I have often observed an abundance of lichens growing on the surface of sandstone, which is inherently soft. In such instances the lichens simply indicated that a crust has been formed on the exposed surface of the stone. This crust is frequently very hard, enduring a sufficiently long time for the growth of lichens.

"If one is desirous of obtaining a considerable quantity of stone perfectly uniform in color and texture, it is important that he should visit the quarry to assure himself that the amount of the quality desired is obtainable. It is possible for a quarry to be exhausted of its good stone, and for this reason an inspection is often a valuable precaution.

"On the other hand, the stone from a certain quarry, in which a large percentage of the stone is first quality may have been condemned by the public, because quarrymen and contractor have permitted the use of a few inferior blocks 'for the sake of economy.' Moreover, in the rush to complete contracts, builders are occasionally obliged to use inferior stone, because of difficulty in securing the proper stone at the right time. In order to know when one is receiving the best stone that a quarry produces, he should be familiar with the possibilities of the quarry."

Aside from quarry observations, Prof. Buckley says that the value of observations on buildings and monuments constructed out of stone as a means of estimating their strength and durability has probably been overestimated.

He says: "Contractors and builders are very ready to attribute any noticeable decay of the stone, in the superstructure of a building, to some unknown inherent weakness. As a rule one cannot pass valuable judgment on the durability of a stone merely from an examination of buildings constructed therefrom. It must be remembered that stone which is durable under ordinary circumstances, may be badly injured and its life materially shortened, through rough or careless quarrying, handling and dressing. The size of a building, its location and the care which is exercised in laying the stone in the walls, are all factors in the life of the stone. The weight of the superstructure is thought in many instances to hasten the rate of decay of the stone in the lower courses, and it is certain that blasting, the use of heavy hammers and improper methods of dressing very materially shorten its life. The stone used in the construction of many buildings is very carefully laid, not a block being placed on edge. Other buildings are constructed with the utmost carelessness, no regard being had for the method of dressing or the manner of laying. Two buildings constructed with equal care, from the same kind and grade of stone, if subjected to different atmospheric conditions, may show a very great difference in the rate of decay. A building in a large city is subject to different conditions than one in the country. One building may be so situated as to be fully protected from the prevailing storms, while another may be so situated that it suffers from every change of weather. Further, one seldom knows, from an inspection of a building, whether the stone in its construction is first, second or third grade. It is not an uncommon occurrence for the stone from an entire district to be condemned, because certain structures, built from third grade stock, have not proved as satisfactory as other buildings, in which number one stone, from another district, has been used. Every quarry has more or less second and third grade stock, which, although suited to a variety of purposes, cannot be used for all purposes. Unfortunately, these poorer grades of stone are often used in the fronts of buildings, or even carved for the finer parts of the architectural work. After stone once becomes a part of a building, people do not stop to distinguish different grades, but charge all imperfections against the quarry, as a whole, from which the stone was taken. Sometimes the entire area, including several quarries, has to suffer."

USE OF OOLITIC STONE IN ENGLAND.



HE STONEMASON, of Bristol, England, is publishing a series of articles on "Stones of England." Concerning the uses of the various kinds of oolitic stone, and their weathering property, the writer says:

Of buildings constructed of oolitic and other limestones we may notice the church of Byland Abbey, of the twelfth century, especially the west front, built of stone from the immediate vicinity, as being in an almost perfect state of preservation. Sandysfoot Castle, near Weymouth, constructed of Portland

oolite in the time of Henry VIII., is an example of that material in excellent condition; a few decomposed stones used in the interior, and which are exceptions to this fact, being from another oolite in the immediate vicinity of the castle. Bow and Arrow Castle and the neighboring ruins of a church of the fourteenth century, in the island of Portland, also afford instances of the Portland oolite in perfect condition. The new church in the island, built in 1766 of a variety of the Portland stone termed roach, is in an excellent state throughout, even to the preservation of the marks of the chisel.

Many buildings constructed of a material similar to the oolite of Ancaster, such as Newark and Grantham churches, and other edifices in various parts of Lincolnshire, have scarcely yielded to the effects of atmospheric influences. Windrush Church, built of an oolite from the neighboring quarry, is in excellent condition; whilst the Abbey Church of Bath, constructed of the oolite in the vicinity of that city, has suffered much from decomposition; as is also the case with the cathedral, St. Nicholas and St. Michael's churches, in Gloucester, erected of a stone from the oolitic rocks of the neighborhood.

The churches of Stamford, Ketton, Colley Weston, Kettering and other places in that part of the country, attest the durability of the shelly oolite termed Barnack Rag, with the exception of those portions of some of them for which the stone has been ill-selected. The excellent condition of those parts which remain of Glastonbury Abbey show the value of a shelly limestone similar to that of Doultong; whilst the stone employed in Wells Cathedral, apparently of the same kind, and not selected with equal care, is in parts decomposed. The mansion, the church, and the remains of the abbey at Montacute, as also many other buildings in that vicinity, constructed of the limestone of Ham Hill, are in excellent condition. In Salisbury Cathedral, built of stone from Chilmark, we have evidence of the general durability of siliciferous limestone, for although the west front has somewhat yielded to the effects of the atmosphere, the excellent condition of the building generally is most striking.

In the public buildings of Oxford we have a marked instance both of decomposition and durability in the materials employed, for whilst a shelly oolite similar to that of Taynton, which is employed in the more ancient parts of the cathedral, in Merton College, chapel, etc., and commonly for the plinths, string-courses and exposed portions of the other edifices in that city, is generally in a good state of preservation, a calcareous stone from Hedington, employed in nearly the whole of the colleges, churches, and other public buildings, is in such a deplorable state of decay that in many instances all traces of architectural decoration have disappeared, and the ashlar itself is in many places deeply disintegrated.

In Spofforth Castle we have a striking example of the unequal decomposition of two materials—a magnesian limestone and a sandstone, the former employed in the decorative parts and the latter for the ashlar or plain facing of the walls. Although the magnesian limestone has been equally exposed with the sandstone to the decomposing effects of the atmosphere, it has remained as perfect in form as when first employed, while the sandstone has suffered considerably from the effects of decomposition.

THE MINERAL RESOURCES OF GUATEMALA.



HE Philadelphia Commercial Museum has published among its bulletins one on the Republic of Guatemala, by Gustavo Niederlein. This is based on observations and studies made by Mr. Niederlein in that republic, and also on authoritative manuscript and official documents. Mr. Niederlein says that a great variety of characters is shown in the geological structure of Guatemala. In the first place, the Quaternary formation (alluvium and diluvium) covers most of the Pacific coast from the foot of the mountains to the sea. The same formation is also observed around Guatemala, Chimaltenango, Chimalapa, Chiquimula, Esquipulas, Jalapa, Pinula, Puerto, Barrios, La Libertad, and in the valley of the Rio de la Pasión.

The Tertiary formation, and especially limestone, covers nearly the entire Department of Petén. Besides, limestones and dolomites of the Upper Cretaceous age are observed from La Libertad and San Benito toward the Usumacinta River, and toward British Honduras, east of San Luis and Santa Barbara. The surroundings of San Luis and Santa Barbara are Tertiary limestone and sandstones of Eocene and Miocene ages. The limestone and dolomites of the Upper Cretaceous age are also found in Alta Verapaz, in the north of Izabal and in the north of Huehuetenango, mixed with Tertiary limestone and sandstones, and followed southward, first in Huehuetenango, then in the north of Quiché and in the south of Alta Verapaz by conglomerates, dolomites and limestones of the Lower Cretaceous age, and again in the same departments further south, and in Baja Verapaz, with limestones and dolomites of the Upper Carboniferous age commingled with Santa Rosa strata (slate, sandstone, pudding stone and carboniferous graywacke), a formation which has also been found around Dolores and eastward of it toward Belen, in the Department of Petén, and again toward the north of Chiantla and toward the south of Cunen in Huehuetenango with pre-carboniferous limestone, also near Rabinal and Salama with crystalline limestone of the Azoic age.

This Tertiary formation is followed by an Azoic formation of gneiss, mica-slate and phylada, with large intrusions of granite, in the Department of Huehuetenango, Quiché, Baja Verapaz, Zacapa, the south of Izabel, in Chiquimula, Jalapa and Guatemala. Granite is further found in the north of Chicacao, around the lake and eastward of the volcano of Atitlan, between Totonicapan and Santa Cruz de Quiché, in Villamesa, Jutiapa, etc.

A kind of hornblende slate has been observed in small spots in Izabal. Around Lake Izabal and along the River Motagua and northward of it, as also southward of Quastatoya and northward of Cobulco and Rabinal, serpentinite has been found.

The eruptive formations which cover the rest of Guatemala are composed as porphyry in the north of Guatemala, in the northwest of Jocotan and

northwest of Zacapulas; of diorite in the southeast of Palmillo; of obsidian in the northeast of Guatemala; of rhyolite and dacite in Olopa, Jocoton, southward of Cuajiniquilapa and northeastward of Guatemala; and of trachyte, together with basalt, rhyolite, obsidian and granite in the northeast of Guatemala, northward and northwestward of Santa Cruz de Quiché, northward of Zacapulas and southward of Izabal.

The eruptive formations are further composed of basalt in the volcanoes of Pacaya, Cerro Redondo, Chingo, Suchitan, Iztepeque, Ipala and Montenegro, also around Jerez, Quezaltepeque, Ipala, Concepcion, Santa Catarina, Mita and Chiquimula; and finally, mostly of andesite in all the rest of the Corderilla and the highlands, as in Tacana, Tejutla, San Marcos, Ostuncalco, Quezaltenango, Totonicapan, Solola, San Lucas, Atitlan, Santa Cruz Quiché, Patzum, Patzizia, Antigua, Amatitlan, Mataesquintla, Cuajiniquilapa, Moyata, Jolotepeque, etc.

Mr. Niederlein also says that asbestos has been found in Salamá and Cubulcó, in Baja Varapaz; graphite in Totonicapan, Huehuetenango, and in Cubulco and Rabinal in Baja Berapaz; slate in Salamá, San Antonio, Chiquin and Huehuetenango; marble in San José de Buenavista, Salamá and Totonicapan. There is no doubt that regions with porphyry, trachyte, basalt, rhyolite, obsidian, gneiss, andesite and granite combined, as found north northeastward of the city of Guatemala, around Chiquimula, Jocoton and Olopa, southward from Zacapa, northward from Quezaltepeque, around Zacapulas and Santa Magdalena, between Uspantan and San Andres, must be rich in minerals, as similar regions are in other parts of the world. Valuable mines might also be found in the Sierra de las Minas and in the Sierra de le Grita, as well as in the Sierra del Espiritu Santo.

STONE PAVEMENTS IN AMERICAN CITIES.



AT the sixth annual meeting of the American Society of Municipal Improvements, held in Toronto, Ontario, on October 3, 4 and 5, there were a number of papers read and discussed which have a decided interest for the stone men of the country. The question of pavements is one of the most important problems that a municipality is called upon to deal with, but it is one that has received adequate treatment only in comparatively recent years. Although so much has been done in many of the progressive cities in the way of laying and maintaining good streets, the proportion of cobblestone pavements is still surprisingly large. The good roads movement in the country has also made gratifying progress, but mud and sand are by no means a thing of the past. One of the most suggestive papers read before this convention was by George W. Tillson, Principal Assistant Engineer of the Department of Highways of Brooklyn, N. Y. Mr. Tillson treated of "The Life of Pavements," and his article is suggestive and valuable. Mr. Tillson rightly says that the question of durability is one of the most important of all as far as pavements are concerned. He adds: "The two great agents that tend to destroy a pav-

ment are traffic and the atmosphere. The former is variable, and its effect varies directly according to the amount applied under certain conditions. The action of the latter is constantly depending somewhat upon the climate, but principally upon the nature of the paving material.

"Traffic and the atmosphere act positively and their results can be measured. At the present time it may be said that there are four materials being used in street pavements—stone, brick, asphalt and wood. The action of traffic and the atmosphere is very different upon these materials as affecting durability. It is safe to say that the life of stone and brick (taking it for granted that none of their kind of a quality to be acted on by the air would be used), in a pavement depends, other things being equal, directly on the amount of the traffic they sustain, but that statement would not be true of asphalt and wood. For should the traffic be light the life of the pavement would be ended by the action of the atmosphere—asphalt not to such an extent as wood, but it is well known that an asphalt pavement deteriorates materially under the oxidizing effect of the air, even if it have little or no traffic.

"It must be remembered, also, that there are two ends to all pavements, the physical and the economic end. The former comes at a time when the pavement is so worn out that it cannot be repaired and must be entirely relaid; the latter when the cost of repairing is such that it will be cheaper to relay it entirely than to spend any money on repairs. These two ends do not necessarily come at the same time. The former test will generally be applied to stone, brick or any block pavement, and the latter to asphalt or macadam. When a pavement is made up of moderately sized parts of practically the same character and texture, the wear on these parts is practically the same and the repairs necessary are generally relaying old material, rather than furnishing new. But when the pavement is made up of parts so small that they must be consolidated into a continuous whole before they can be available it is different.

"The physical end of a pavement can be determined by observation. Blocks wear on account of abrasion and impact. Granite wears in two ways, by chipping and rounding off of the corners, and the gradual grinding off of the blocks under the friction of wheeled vehicles. When the blocks are of the harder granite or traps the former action takes place. The softer granites and the sandstones wear down smoothly with flat surfaces, and in time the blocks actually become worn out, the pavement becomes rough, horses stumble, and it is soon seen that the street should be repaved. Asphalt and macadam wear away, and new material can be added in large or small quantities as may be desired, and the physical life of the pavement prolonged indefinitely. It is then that the economic test is applied to ascertain when the pavement should be renewed."

Mr. Tillson has the following to say about granite and macadam:

"Granite blocks are generally laid in two ways, viz.: On a concrete base with joints filled with tar and gravel, and on a sand cushion with sand joints. The resulting pavements must be considered as being in separate classes. The reason why the same granite wears out more quickly when

laid on sand is because the blocks follow any inequalities in the foundation and the sand in the joints is often washed out and allows more or less water to percolate down to the foundation, causing unequal settlements. All of these actions affect the stability of the blocks and often cause their displacement, thus preventing the traffic from being applied in accordance with the principle previously laid down, i. e., vertically upon the face of the block, and the result is abnormal wear. Probably the best example of a first-class granite pavement is that upon the approaches of the New York and Brooklyn suspension bridge. This was thrown open to traffic in May, 1883, and consequently has been in use about sixteen and a half years. During this time it has been subjected to a severe and continuous traffic. The roadway is 16 feet wide. The dimensions of the blocks are 3 to 4 inches wide by 8 to 9 inches deep and 9 to 14 inches long. These were laid on a concrete base and a 2-inch sand cushion with three-fourths inch joints between courses. These joints were partially filled with tar and gravel which was thoroughly consolidated with a calking iron driven home by a heavy hammer when the joint was refilled as before. This pavement has received practically no repairs up to the present time, and Mr. Martin, engineer of the bridge, estimates its further life of ten years, or 26 in all, for a pavement that probably sustains a heavier tonnage per foot of roadway than any street in the country. An article in the "Electric Engineering Magazine" states that on streets near the docks of Liverpool where the traffic was 360,000 tons per yard of width per annum, the average wear was .02 of an inch per annum. In Leith, Scotland, the repairs to granite are nil for the first ten years, and from that time to 25 years an average of four cents per yard per year. In Brooklyn, Clinton street was paved with granite on a sand foundation about 23 years ago. This is a residential street and has a moderate though not a heavy traffic, has received absolutely no repairs and is in such a condition to-day that from eight to ten years' further wear may be expected of it. The authorities of the following foreign cities give as the life of granite pavement: Paris, Liverpool and Edinburgh, 30 years each, and Glasgow as high as 50 years. Engineers of the United States do as a rule assign so long a life, and it is doubtful if our granite is as durable as that used in Europe, so that it is reasonable to suppose that their pavements will last longer despite their greater traffic. It would seem fair then to estimate the life of a granite pavement on concrete with tar and gravel joints at 25 years and on a sand base at 20 years.

"Macadam pavement can truly be said to have no end if properly cared for, but it requires an almost constant infusion of elixir of repairs to bring about this eternal life. The exact amount depends upon the traffic and character of the stone, varying greatly in different cities. Nashville, Tenn., renews some of her streets twice in one year. One technical journal states that a street in St. Louis has had enough broken stone spread upon it to raise its surface 22 feet. In 1884, in London, macadam on Parliament street cost 70 cents; on Whitehall street, 71 cents, and on Victoria street, 50 cents per yard for repairs. Glasgow maintains her macadam streets at an annual cost of 12 cents per yard, while Paris, in 1893, paid 44 cents for the same purpose. The author will not attempt to assign a limit for macadam."

At the Toronto meeting mention was made in the discussion of the difficulty of securing accurate statistics with regard to municipal work, and the effort in this direction that is being put forth by the labor bureaus of the several States and the National Department of Labor. In the last bulletin issued by Commissioner Carroll D. Wright, dated September, are presented many tables of municipal statistics covering a wide variety of subjects. Among the most valuable of those presented were statistics from 140 of the leading cities giving the area of streets paved and the kind of pavement. From this we extract the figures from some of the more important cities as to the different kinds of stone pavements laid. Only those are included in the following table which have to exceed 500,000 square yards of granite pavement:

	Granite. Square yards.	Cobblestones. Square yards.	Macadam Square yards.
Albany	527,037	413,737	54,871
Atlanta	929,456	.....	89,760
Baltimore	638,336	5,815,610	400,000
Boston	1,859,248	12,471	4,996,684
Chicago	526,200	45,800	7,202,000
Cincinnati	968,350	1,213,000	3,074,000
Cleveland	1,619,200	.....	.....
Jersey City	1,199,760	.....	253,440
Newark	948,077	297,513	238,234
New Orleans	500,896	712,624	.....
New York	8,201,600	4,213,616	12,372,096
Philadelphia	5,760,509	2,920,664	1,946,774
Pittsburg	1,722,874	1,147,415	156,288
Providence	516,912	89,408	2,456,432
St. Louis	1,060,857	.....	5,583,706
Washington	567,200	251,645	787,741

Aside from these the following are the cities which have more than one-half a million square yards of macadam paving. A little more than one-half of these, it will be seen, are eastern cities. It will also be noticed that much has been done in the way of macadamizing streets in the Middle, Southern and Far Western States. In fact the greatest showing of all, as far as area is concerned, is made by San Francisco, with more than five and a half million of square yards, but San Francisco has not done equally well in other lines of pavements, as there are 429,289 square yards of cobblestones, while no granite, brick, or asphalt are reported, and there are 6,994,110 square yards of unpaved streets. The figures for macadamizing are as follows:

Bridgeport, Ct., 1,342,300; Dubuque, Ia., 999,256; Duluth, Minn., 570,-240; Fall River, Mass., 681,777; Fort Worth, Texas, 1,750,000; Harrisburg, Pa., 560,060; Hartford, Ct., 1,314,131; Kansas City, Mo., 990,157; Lancaster, Pa., 568,000; Louisville, Ky., 2,264,013; Lynn, Mass., 2,053,333; Nashville, Tenn., 2,302,033; New Bedford, Mass., 574,035; New Haven, Ct., 984,798; Oakland, Cal., 2,566,000; Paterson, N. J., 950,400; Portland, Ore., 1,075,965; Reading, Pa., 622,350; Salem, Mass., 704,000; San Francisco, Cal., 5,694,952; Somerville, Mass., 2,155,965; Worcester, Mass., 633,600.

THE MINERAL INDUSTRY OF GREAT BRITAIN.

THE important part that the mineral industry of Great Britain takes in the wealth of that country is probably realized by all readers of this magazine. Great Britain's prominence in the manufacturing field is largely due to her magnificent deposits of iron and coal and the use that has been made of them. But aside from these the country has a great wealth in stone and other non-metalliferous minerals. The geological structure of the British Islands is widely diversified, and one might in a day's journey traverse rocks of every geological age. Most of the minerals have a well defined local distribution, although a few of them are fairly evenly distributed. It is declared by scientists that only two of the geological formations of Europe, and these only of small importance, are wanting within the limits of the United Kingdom. The Eozoic rocks, the oldest of all, which form virtually the foundation of the islands, are exposed only in small area in the northwest of Scotland and Ireland. There are a few other small exposures, but not important enough for special mention. The Paleozoic rocks, next oldest in the geological scale of time, occupy a large area, covering nearly the whole of Scotland and Ireland, forming the more elevated districts of England and Wales. They have been greatly disturbed and present a very complicated structure. The Mesozoic rocks occupy the central and most of the eastern portion of England, broadening out in great plains at the foot of the rugged Paleozoic districts. They are found in nearly horizontal beds, and while mining is not as prominent a feature with them as with other formations, still many of the strata are quarried for various industrial purposes.

"The Quarry and Builders' Merchant," the leading magazine of its class in England, is publishing a series of articles on the mineral industries of the United Kingdom, which form the basis of the present article. From this periodical is taken the accompanying map, and I quote freely from its statements as to the geological formations and the local distribution of the different minerals. The articles, however, make use of the statistics of production for 1897. Since they were written there has appeared the Parliament Blue Book, giving the general report and statistics of mines and quarries for 1898. This is edited by C. Le Neve Foster, D. Sc., F. R. S., one of Her Majesty's Inspectors of Mines. Report III. gives the figures in relation to output. The following are some of the chief results to be obtained from the figures in this volume: The total value of all minerals raised in the United Kingdom in 1898 exceeded seventy-seven million pounds, an increase of more than five millions compared with that of the previous year. This increase in value is mainly attributable to the high prices obtained for coal. Taking the various divisions of the United Kingdom separately, we find that England produces minerals worth fifty-five million, Wales ten and a half million, Scotland eleven million and Ireland less than one-quarter of a million pounds. Nearly one-half of the mineral industry of the Kingdom is concentrated in the four great coal counties of Durham, Yorkshire, Lancashire and Glamor-

ganshire, which produce the enormous total of 103,841,795 tons of coal. The accompanying map which, as before stated, is reproduced from "The Quarry and Builders' Merchant," shows at a glance the local distribution of stone, clays, chalks, gravels, etc.

Chalk.—The greater part of the chalk quarried in Great Britain is employed in the manufacture of lime and cement, but small quantities are used as building stone, when sufficiently indurated, as well as for agricultural and chemical purposes and in the preparation of whiting. A little chalk is raised from mines, but the total quantity is insignificant compared with the output of the open quarries. Kent is by far the most important chalk yielding country and many of the quarries produce more than 100,000 tons annually. Much of the chalk in Kent and Essex is employed in the manufacture of Portland cement on the banks of the Thames and the Medway. The total output for 1898 was 1,878 tons from the mines, 4,296,136 from quarries, a grand total of 4,298,014 tons valued at £180,651.

Chert and Flint.—Chert is obtained principally from strata of carboniferous age in Derbyshire and Flintshire. It is used locally for road metal, but chiefly as a grindstone for pottery mixture. The Lydian stone or basanite of Devonshire is an impure black variety of chert used as a touch-stone for testing the quality of gold and also as a hone stone. Flint is mainly obtained from open chalk beds. At Brandon, in Suffolk County, there are still a few shallow mines, worked in a most primitive fashion, which suffice to supply the gradually decreasing demand for gun flints, exported to savage countries. Last year, however, there were made no less than 6,300,000 of these gun flints. The total production of chert and flint for England, Wales and Ireland was 82,057 tons valued at £14,513.

Clay.—Many of the workings for clay and brickearth are less than twenty feet deep, and so escape the operations of the Quarries Act, under which returns are compulsory. Complete figures of production cannot therefore be given. There are few counties in England that do not produce minerals employed in the manufacture of bricks, and the strata from which they are dug belong to very various geological ages. Fireclay is largely taken from the coal measures, and in Cornwall and Devon the China clay is derived from granite decomposed *in situ*. The total output for the United Kingdom for 1898 was 14,738,474 tons valued at £1,616,358.

Granite and Syenite.—The term granite is used as vaguely in Great Britain as in America, so that it is impossible to separate the returns and give the figures which apply to granite in its strictest sense. The total production for 1898 was 1,875,817 tons valued at £576,457. More than one-half of the total output is from the single County of Leicester, which produces largely syenite. The quarries at Aberdeenshire produce about one-sixth of the output.

Gravel and Sand.—The figures for gravel and sand include only those taken from a depth of more than twenty feet. The total for 1898 was 1,625,690 tons, valued at £135,538.

Gypsum.—The hydrous sulphate of lime occurring in massive form is used in the manufacture of plaster of Paris. It also forms the basis of stucco



DISTRIBUTION OF THE VARIOUS STONES IN GREAT BRITAIN.

and certain kinds of cement. With reference to the term alabaster, it must be remembered that this substance does not include the oriental alabaster, under which name many of the stalagmitic limestone or onyx marbles are sometimes known. Most of the British gypsum is wanting in uniformity of tint owing to streaks of oxide of iron, but the finest blocks are picked out for use in turning alabaster ornaments, an industry which suffers from the importation of Italian ornamental goods manufactured from the pure white alabaster of Tuscany. The total output for 1898 was 196,028 tons valued at £71,316.

Igneous Rocks other than Granite.—The rocks grouped under this heading are principally used for making road metal and paving stones. Carnarvonshire, in Wales, is by far the largest producer, with its important quarries of diorite and quartz and augite porphyry. Shropshire is second, with its basalt quarries at Clee Hill, and it is followed by Yorkshire, where "whinstone" is extensively worked in the neighborhood of Middleton-in-Teesdale. There are also workings for basalt at Rowley Regis, in Staffordshire, and at diorite quarries at Atherstone and Nuneaton in Warwickshire. The output for 1898 was 2,602,491 tons valued at £465,543.

Jet.—Small and variable quantities of jet are obtained in Yorkshire in the neighborhood of Whitby. It is a compact variety of lignite, occurring in the shales, and is occasionally thrown up on the shore during rough weather. It is not regularly worked, but farm laborers burrow for the mineral during stormy weather when there is no suitable occupation for them out-of-doors. The production is extremely variable, reaching as high as 4,670 pounds valued at £934 in 1886. Since then, however, the output has dropped until it reached 84 pounds in 1897 valued at £8. In 1898 no jet was obtained. Much of the jet used in Great Britain in the manufacture of ornamental articles is imported from Spain.

Limestone.—Limestone is very widely distributed through the United Kingdom. It is quarried in three-fourths of the counties of England, five-sixths of the counties of Wales, one-half of the counties of Scotland and in nearly every county of Ireland. Even without taking chalk into account, it is one of the most important minerals quarried in Great Britain. The total output in 1898 for Great Britain was 11,980,578 tons valued at £1,256,154. Of this total England contributed £941,645, Wales £152,684, Scotland £113,397, Ireland £45,615, and even the little Isle of Man £2,813. The term limestone here includes rocks used for various purposes. The harder Paleozoic limestones, which are capable of taking a polish, form marbles, of which the Carboniferous and Devonian systems yield the best known varieties. Marbles from these formations are produced in Derbyshire, Staffordshire, Devonshire, Bristol and the Isle of Man; while in the carboniferous limestone of Ireland valuable quarries exist in Kilkenny, Carlow, Galway and Mayo, many of which yield black varieties of marble. Beautiful red marbles are obtained in Limerick, Clare and Cork; white marbles are obtained in Connemara and Sienna marble in Kings County. Older marble than the carboniferous include the green serpentinous marble of Connemara and the pink Tiree marble. The limestones from the Mesozoic rocks are used chiefly as building stones, the Jurassic rocks furnishing the chief supply, of which

the Portland and Bath stones are the most widely known. Dolomite or magnesian limestones are also largely quarried for building purposes, for the production of magnesium salts and the manufacture of basic bricks for the linings of Bessemer converters. Enormous quantities of limestone are also used for general purposes, such as road stone, lime burning, cement manufacturing and as a flux in metallurgical operations.

Mica.—This mineral is not produced in any quantity in the British Isles. It is obtained as a by-product in the preparation of china clay, and the output for 1898 was only 907 tons valued at £454.

Plumbago.—This industry is completely exhausted in Great Britain so far as any known supplies of graphite are concerned. The once famous mines of Borrowdale, in Cumberland, have yielded as much as £100,000 worth of graphite a year, and as late as 1875 a small quantity (20 tons) was raised. There was no production, however, in any part of the United Kingdom in 1898.

Sandstone.—Under this heading are included all indurated sedimentary rocks which consisted originally of particles of siliceous sand, such as ordinary sandstone, grit, quartize, "ganister" and also some "flagstone" and "freestone." The British sandstones are very widely distributed, as they occur in rocks of almost every geological age. These sandstones include nearly every variety of sandstone rocks, the thinly bedded flagstones being used for paving, freestones for building and hard gritty sandstones for grinding purposes. The old red sandstone also supplies both building stone and the well-known flagstones of Arbroath and Dundee. In the Mesozoic strata sandstone occurs in the new red of the Midland counties and in the Yorkshire oolites, while the Wealden sandstones of Kent are extensively used for local purposes. The Tertiary strata are, as a rule, not sufficiently consolidated to yield sandstones of economic value; but a notable exception is to be found in the Grey Wether or Sarsen stone, a sandstone with a siliceous cement almost approximating to the hardness of quartzite.

The value of sandstones varies considerably with their lithological peculiarities, their durability depending chiefly upon the nature of the material by which the grains are cemented together. The output for the entire United Kingdom in 1898 was 5,242,115 tons valued at £1,623,786.

Slate and Slate Slabs.—The returns under this head only include the true argillaceous slates and do not include fissile limestones and fissile sandstone, which are used to some extent for roofing purposes and are known locally as "slate." The total output for 1898 was 668,859 tons valued at £1,900,228. Of this total England contributed £126,160, Wales £1,668,980, Scotland £85,976 and Ireland £17,830. The United Kingdom was enabled to export slate to the value of £187,781 in 1898, of which by far the largest quantity went to Germany, with Denmark second and Australasia third.

"The Quarry and Builders' Merchant" closes its second article with a general review of the whole field of mineral production in the United Kingdom. While the writer draws attention to the fact that the output of the United States is half as much again as that of Great Britain, he adds: "Considering, however, the very limited area of the British Isles, and the length of time during which her mineral stores have been drawn upon for the

world's use, her present position, in spite of the partial exhaustion of her resources, and the rapid development of new mineral fields in other lands, is a striking proof of the boundless stores of mineral wealth which have contributed so largely to the unexampled prosperity of our country. That some of our industries are declining is only a natural result which must sooner or later overtake our competitors also, in proportion as the more accessible minerals become exhausted and further supplies have to be drawn at increased expense from greater depths." Further on the writer says: "If, however, our metallic mining industry is not, in some respects, in a hopeful condition, the same cannot be said of the prospects of stone production. Here the symptoms are those of boundless future expansion. The increased use of high-class materials for building and road construction, following naturally upon improved facilities in both quarrying and transport, have tended largely to develop the production of the better kinds of stone, of which, thanks to our geological structure, we have an unlimited and varied supply. Foreign competition has not here the same effect as in the case of metallic ores. Certain stones as, for example, granite from Scandinavia, basalt from the Rhine, quartzite from the Cherbourg, limestone from Normandy and marble from Italy, do indeed get a footing within our shores; but our home industries are not in this case handicapped, as with ores, either by the partial exhaustion of our supplies, or by the occurrence of the foreign productions under natural conditions different from those prevailing in our own country."

It is interesting to draw a comparison between the production of stone in Great Britain and the United States, based upon the statistics for both countries for 1898. Unfortunately an absolutely correct comparison cannot be made owing to different methods of compilation. Thus, for instance, marble is given a separate table in this country, while in the English statistics it is included with the limestones. So, too, we have figures for bluestone, unknown as such in England, and so our bluestone production must be added to the sandstone statistics. Turning the English currency roughly into American, and unifying as far as possible the classifications, we get the following results:

ENGLISH STONE PRODUCTION FOR 1898.

Granite	\$2,582,000
Slate	9,501,000
Sandstone	8,163,000
Limestone	6,280,000
	—————
	\$26,526,000

PRODUCTION OF STONE IN THE UNITED STATES FOR 1898.

Granite	\$9,258,406
Slate	3,723,540
Sandstone (including bluestone, estimated) ..	5,619,412
Limestone (including marbles)	9,668,996
	—————
	\$38,270,354

It will be seen that these figures are mainly for stone produced for building and decorative purposes, except in the cases of limestone for lime

burning and fluxing, and sandstone for flagging and abrasive purposes. It is impossible to get together any figures relating to crushed stone used for road metal.

Part II. of the Parliamentary Blue Book on Mines and Quarries, dealing with labor, was issued subsequent to Part III., and has come to hand since the writing of the above. This gives the statistics relating to the number of persons employed and the accidents at mines and quarries. The total number of persons employed at mines and quarries under the Quarries Act of the United Kingdom and the Isle of Man during the year of 1898 was 875,603, of whom 741,125 were employed in or about mines and 134,478 in or about quarries. The total number employed in the quarries exceeded by 11,108 the number employed the previous year. Of the total of 134,478 persons, 62,752, including seven females, worked inside the actual pits, holes or excavations, while 71,726, including 1,505 females, were employed at factories and workshops outside. Most of the women and girls are engaged at the brick works connected with the quarries. The increase in the number of employees is thought to be due principally to the fact of more complete returns from the quarries under the general Quarries Act. In 1898, 990 separate fatal accidents occurred in and about the mines and quarries of the United Kingdom, causing the loss of 1,075 lives. Compared with the previous year, there is a decrease of 25 in the number of fatal accidents and a decrease of 27 in the number of lives lost. Of these accidents 859, causing the loss of 941 lives, happened at mines, and 131, causing the loss of 134 lives, happened at quarries. The number of employees and of fatal accidents according to the different minerals worked, were as follows:

	Employees.	Deaths.
Chalk	10,407	7
Clay and brick earth.....	42,449	28
Granite	9,101	7
Igneous rocks other than granite.....	8,413	6
Iron ore	2,451	0
Limestone other than chalk.....	19,808	27
Sandstone	24,812	38
Slate	13,749	14
Other rocks and minerals.....	3,288	7
<hr/>		<hr/>
	134,478	134

Of the fatal accidents, 100 occurred inside of the quarries and 34 outside. Of those inside the quarries, 44 deaths were caused by falls of ground, ten by blasting, two during ascent or descent and 34 from miscellaneous causes. As in the case of mines, the accidents in quarries due to falls of ground exceeded by far those rising from other causes. The death rate for the year from this cause per 1,000 people employed was .76. Failure to keep the overburden and loose ground sufficiently back from the face of the quarries; undercutting loose and soft strata, such as gravel, sand, clay, etc.; want of care in observing the nature and aspect of the ground while working (especially after exceptional atmospheric conditions, heavy rains, severe frost, etc.), are among the causes referred to by the inspectors as contribut-

ing to these accidents. Owing to the enforcement of the rule in regard to the fencing of quarries, only four fatal accidents to the public in connection with quarries came to the knowledge of the inspectors in 1898, and in each case the victim was intoxicated.

The provisions of the Quarries Act are rigidly enforced in Great Britain, and in this matter the United States might well take pattern from the mother country. There were 97 prosecutions and 87 convictions against owners, agents, etc., for various offences against the Quarries Act, of which by far the larger proportion was for breaches of special rules about the safety of quarry explosives and the accessories to quarry machinery. There were 16 prosecutions and 16 convictions of workmen for offences, all of which were for breaches of special rules relating to explosives and blasting. There were 51 prosecutions and the same number of convictions of occupiers of factories and workshops connected with the quarries for offences under the Factory and Workshop Acts.

The special rules for quarries which have been drawn up with great care are now enforced at over 2,000 quarries, and this number may be taken as including practically all of the larger and more important quarries in the country. The Blue Book ends with an imposing list of managers and under-managers to whom certificates of competency were granted during the year. If managers of American quarries and mines were compelled to obtain certificates of competency from a Governmental Board of Inspection the results might be of general benefit to the stone industry in this country.

ESTIMATES FOR SAMPLE ROAD.



T requires about 10 cubic yards of broken stone for a roadbed two rods long (33 feet) and 12 feet wide. The earth foundation must be made dry and hard with shoulders of earth at sides to retain the stone bed. The first course of broken stone should be of the larger size, as they come from the revolving screen of the crusher, averaging about $2\frac{1}{2}$ inches in diameter. This course is to be put on at a depth to make four inches when rolled. After rolling the voids are to be filled with stone which passes through the first section of the revolving screen. After rolling, this course is made uniform and solid. Then the second course is applied, which consists of stone passing through the second section of the screen, averaging $1\frac{1}{2}$ inches in size. This is first rolled and then screening applied as before mentioned, until all voids are filled. The mass becomes hard, water-tight and smooth. The rolling after the screenings are applied, is to be aided by the application of water. This can be done with the ordinary street sprinkler.

For common dirt roads there should be an under drain of tiling 2 to 3 inches, about $2\frac{1}{2}$ to 3 feet deep, under center of roadbed. After filling and compacting so as to prevent settling, the road should be well rounded up in the center, so when finished, it will have a slope from center to sides of $\frac{1}{2}$ to 1 foot. On grades this should be increased as the grade increases,

so the water will always run from center of road to side, as nearly at right angles with center of road as possible. After rounding up the road, have a common farm harrow to pass over it, so as to mix the earth and get as near uniform in character as possible. This will also bring the loose stones, sticks, leaves, grass and such matter to the surface, where it can be seen and readily removed. After this give it a thorough rolling, always beginning at the sides of the road and working inward. In very dry weather the earth bed should be sprinkled and allowed to soak in. It is therefore better to sprinkle late in the afternoon or in the evening, and roll next day. The rolling should be continued until its bed has become quite hard and firm. It will then cast off ordinary showers and rainfalls. In long continued rains the water will pass into the earth. The drain will convey this off. So a road treated in this way will not get miry or have the mud very deep on it.

It must be remembered that the object in road construction is to get rid of the water and maintain a surface which will be hard, smooth, and fit for use at all seasons of the year.

In the use of broken stone it must be remembered we are to get the stone so close that they will lock and interlock together. This gives firmness, and at the same time lessens the voids, which are to be filled with ground stone or fine sand, so the water will not pass through the stone bed and dissolve the foundation, so that it will yield to pressure, and thus become rough and uneven, and cause water to remain in small pools on the surface, which will cause wear by wheels of wagons grinding the stone, when softened in these pools of water.

In the use of stone it is well to remember to secure the locking of the stones. Different sizes must be kept together in separate courses, hence the use of a revolving screen with holes for stone to pass through, and bins to receive them is indispensable. No good road can be made without a revolving screen to separate the stone in sizes, and the good roller to act the part of a mason in putting them together, so you can get a water-tight roof over your earth roadbed, and such a roof as will be hard and smooth for comfortable and economical travel.

E. G. HARRISON.

United States Special Agent.

FRONTENAC STONE AND THE MINNESOTA CAPITOL.

 HERE has been some criticism in Minnesota concerning the use of marble in the construction of the State Capitol building at St. Paul, instead of a native stone of the State. Architect Cass Gilbert, who designed the building, has written a letter explaining why Frontenac stone was not used. Mr. Gilbert says:

"In the first place, I have been informed by the architects of the Cathedral of St. John the Divine, that the Frontenac stone is to be used for interior facings only, and not for the exterior of the building; that it was selected for this purpose because it was of a warm neutral yellow color that would

harmonize with certain interior decorations of the marble and mosaic which they intend to make a feature in that building. In other words, that it was purely a matter of decorative design. A large portion of the cathedral has been constructed to a height of 75 to 100 feet, and so far as discernible from the exterior, Frontenac stone has not been used therein. In other words, it is not to be used structurally, nor for the exterior, but purely for decorative purposes. I may say, then, the architects selected this material for its beauty, for a specific purpose, regardless of any other qualities and regardless of the locality from which it came. Had they been governed by the considerations that are often urged upon those in charge of the new Capitol building, the stone would have been ordered from some quarry in New York and not have come from Minnesota."

Mr. Gilbert then goes on to tell of the effort he made to have the managers of the Frontenac quarries submit samples of their stone and make a bid on the building. The quarry people, however, doubted their ability to supply sound stone of the large dimensions required for the capitol, as they informed Mr. Gilbert. Although every opportunity was given them, he says, they submitted no bid.

Mr. Gilbert concludes his letter with a paragraph that has a particular interest, in view of the criticism that was called out and the opposition that was aroused by the acceptance of his plans for the New York Custom House. Mr. Gilbert says:

"I have always hoped that the means at our disposal would permit us to use Frontenac and other Minnesota stones for certain interior finish of the building, but the criticism of the new Capitol building, born in ignorance, though perhaps with good intention, has operated, so far, to limit the action of the Board of Commissioners in many ways, and will, if continued, prevent even this intention being consummated. Minnesota sells her wheat, lumber, iron and other products all over the Union, and she is too great a State to surround herself with a Chinese wall which would exclude materials produced from without her borders. The best, no matter where produced, is none too good for Minnesota. We are trying to build a State Capitol that will be a credit to the State, and one in which our people can take a just pride, and I am confident that when it is finished the large majority of the citizens of the State will agree that our ambition in this regard has been reasonably fulfilled, and I for one am perfectly willing to leave it to such judgment."

Comment on Timely Topics

LOCAL JEALOUSIES AND THE NAVY ARCH.

SHORTLY after Admiral Dewey and his forces won the engagement in Manila Bay, various cities, with characteristic American enterprise and enthusiasm, began to talk of magnificent memorials to perpetuate the glory of the victory. Monuments and statues of all kinds were planned, and at least two of the cities, Chicago and San Francisco, entered the field with definite end in view. Each of these, we believe, was to raise the sum of \$100,000 for a monument. The newspapers have not kept the public informed as to the progress made in raising the proposed funds. When Admiral Dewey finally returned, he was welcomed in New York as few victors have ever been greeted in the history of the world. The most striking feature connected with his reception was the Dewey arch, made possible by the public spirit and generous efforts of the sculptors of New York. So beautiful and unique was this temporary memorial that there arose an almost universal demand for its duplication in permanent form. Steps have been taken to carry out in this direction the clearly expressed will of the people. That it will fail of accomplishment, scarcely anyone is willing to believe.

Here, then, is an excellent opportunity for Americans to create a magnificent memorial and to add immeasurably to the artistic wealth of the country. But there is evidence that the best energy of the people will be dissipated in local jealousies and in attempting to accomplish too much. We sincerely believe that the best interests of the entire country, considered from an artistic and aesthetic standpoint, will be subserved by the erection of a single splendid memorial to American prowess as displayed in the recent war. We do not mean to imply that this should necessarily be erected in New York City, although we heartily believe that no proposition heretofore submitted has anything like equal merit. Civic pride is an admirable thing and always to be encouraged, but local jealousies that would now stand in the way of a great National achievement have already had unfortunate results in other instances. There are only two cities, it seems to us, that can make legitimate claim to such a memorial as it is proposed to erect. Very strong claims can be adduced in favor of the city of Washington, as the capitol of the Nation and the headquarters of the Army and Navy. But New York City should have greater right to this particular monument. As the undoubted metropolis of the country, the fame and greatness of the city should be the pride of every American, as that of London is to Englishmen and Paris to Frenchmen. In no other place would it be seen and admired daily by so many citizens. It would constantly be in evidence to all foreign visitors to our shores, and would mark the spot where the greatest com-

mander of the war was welcomed at his home-coming with the homage of the entire people. Finally, New York is the only city that has made a good start in the matter and that presents a definite and well-matured proposition.

If other cities, through what we believe to be a mistaken spirit, do not care to give to the artistic enrichment of New York, doubtless sufficient money can be obtained from her own citizens to carry out this great work. But all who take the broadest view will regret if the arch is not made a great National memorial and the admiration of the world. This can best be done by raising a fund of such size that the designers and builders may have a free hand. We are sure that this would contribute more to the glory of the country than half a dozen scattered memorials whose aggregate cost might exceed two-fold the sum necessary to complete the arch. We are led to make this statement by the fact that New York's vigorous effort has already led to the formulation of a number of schemes for similar memorials elsewhere.

It is reported in the daily press that the mayor of Milwaukee, when asked to invite contributions for the New York arch, emphatically refused to present the matter to the citizens, but declared that Milwaukee's money would be expended for a memorial in that city, and he is reported to have called a meeting to that end. Congressmen are said to be preparing bills for monuments or arches at Washington and elsewhere. A newspaper correspondent says that the President will recommend to Congress the erection of a magnificent bridge over the Potomac as a splendid memorial to American patriotism, many millions to be appropriated for the purpose. This plan is said to be very dear to the President's heart, and to have been in consideration for months. As was said at the beginning of this article, we believe that all of the patriotic contributions of the country should be centered in one grand memorial, and we are convinced that the erection of a New York arch would receive the suffrage of the largest proportion of citizens if the matter could be put to a fair test.

THE PROPOSED BRITISH MONUMENT ON BOSTON COMMON.

SOME time ago the Victorian Society, an organization of Englishmen residing in Boston, asked permission of the authorities of that city to erect a memorial on Boston Common to the British soldiers who fell at the battle of Bunker Hill. In view of the friendly relations that exist at present between Great Britain and America, the proposition seemed a natural one and permission was granted. But there has recently developed a most decided opposition to the plan, and the Common Council has passed resolutions requesting the mayor to withdraw his approval. One excited individual has written a letter in which he announces an intention of blowing up the memorial with dynamite if ever it is erected, in emulation of the destruction of the André monument at Tappan. It would seem as if the persons who have formulated these protests were laboring under some misapprehension. According to the accounts that have been published, it is not proposed to erect a stately monument glorifying British valor, which might reasonably

give offense, in view of the relations that led to and accompanied the Revolution. The suggestion was merely to erect a simple Celtic cross in memory of the many soldiers who fell in battle and who now lie in unmarked graves. The North and the South fought just as bitterly against each other during the Civil War as did our forefathers against the British, and yet both victors and vanquished have united in these beautiful memorials to fallen heroes. If the freedom of our country means anything, it should mean the freedom for individual action like this. The proposed monument has no connection whatever with the English government, but is merely a tribute from Englishmen to their fellow countrymen. While there may be question as to the judgment and taste that led to the destruction of the monument to André, the two cases are in no way similar. André was a spy in communication with a detested traitor, but the British soldiers were openly fighting enemies in arms against them. Unjust as we believe their cause to be, why should we begrudge a cross to their memory? A monument to a brave but defeated foe only adds to the glory of the victor.

TRUSTS IN THE STONE FIELD.

THE editor of STONE has received a number of letters making inquiry as to alleged trusts in the stone field. Only a daily newspaper could keep pace with the various reports in connection with the forming of trusts and combinations affecting various branches of the industry. Scarcely a day goes by without bringing news of some new combination that is attempted or of efforts that have seemed full of brilliant prospects of success, but have failed in the end. Options by the score have been obtained, and large banking houses in the leading cities have been approached with requests to underwrite various combinations. The granite field of New England, the Indiana limestone field, the stone trade of the Middle West, the cement industry of the South and West, and Hudson River bluestone are some of the enterprises that have engaged the attention of the promoters.

The latest effort in this line that seems to have failed of achievement is the proposed Barre combination. Options on the various properties expired on October 31st. But so far as can be learned, no extensions have been secured, at least on the largest quarries. It would seem, therefore, as if this scheme were dead for the present year. The failure of this effort is said to have been the difficulty of obtaining the necessary amount of money. It was proposed as a last resort to make the quarry owners stockholders in the combination, but this was not looked upon with favor. The stringency in the money market has doubtless had much to do with the lack of success in establishing the various proposed trusts. It is more than doubtful if money will become plentiful enough for some months to permit the carrying out of any of these plans. We believe that this is an extremely fortunate thing for the stone trade, in order that there may be some time for serious reflection. The country has gone almost trust mad, and we have little doubt that during the present season of general prosperity and of unexampled demand for stone and building materials, the stone industry at large will be more greatly benefited by individual operations than by combinations.



Chicago men have purchased the large granite quarries of Philip Fox, near the city of Waterloo, Wis., and will at once proceed to develop them.

The Hop Hollow Stone Co., Major Rust, manager, at Alton, Ill., has resumed operations with a large force of men. The quarry was formerly conducted by Golike & Rust, and has been shut down for a long time. The resumption is due to the increased demand for building stone.

Work has been begun stripping off the earth overlying a new bed of stone at the Plymouth (O.) stone quarry, and the work will be pushed as rapidly as the weather permits.

A large blast was recently fired at the Catalina Island quarry which was intended to show whether the rock will hold out for the San Pedro harbor work, or whether the quarry will have to be abandoned. The work was entirely successful and the contractors promise to rush the work along.

A suit for trespass has been brought by the heirs of the late Henry Lewis, in Van Buren township, near Dayton, O., against E. H. Fauver & Co., who operated a stone quarry adjoining land belonging to the plaintiffs.

The Sandusky and Inter-Urban Electric railway has purchased five acres of land in Sandusky, O., and will open a quarry for the purpose of securing stone to be used on the line for ballast.

Messrs. Billings & Watts have a large crew of workmen engaged in their granite quarries in Ludlow, Me. The firm would like to spend a large amount of money in improvements, but are not willing to do so

unless they can get a long lease of the quarry property. They are at present working on a short lease.

The Hartford (Conn.) city quarry will probably keep men at work all winter, blasting and quarrying rock for city work.

Messrs. C. W. Babcock and F. S. Wilcox, prominent Western stone dealers, who operate quarries at Kasota and Mankato, have been examining quarry property at Winona with a view of extending their operations.

A large number of workmen are engaged in opening a limestone quarry at White Sulphur, four miles west of Delaware, O., on the line of the Big Four railroad. Quarry operations will be on an extensive scale and lime kilns will be erected.

Between 200 and 300 tons of rock a day are being taken from the Sweetwater quarries for the Coronado jetty in California. Compressed air machinery is being installed and another derrick is being added. The quarry will be nearly 1,000 feet long when the work gets well under way. A large force of men is employed.

A short strike over the matter of pay day took place among fifty men in the employ of the Palisades Stone Company, operating quarries near Belle Plain, Ia. The men gained their point.

The Lithopolis (O.) quarries have been busy all summer. The stock of building stone in Columbus is said to be almost depleted, and there is not half enough in sight for current demands.

Work is very brisk at the stone quarry in Mansfield, O. Land is being stripped for operations next year, and as more than

twenty-five feet of earth overlies the stone the task is a severe one.

J. B. Carter & Son, of Kokomo, Ind., have sold their stone quarries at that place to J. M. Leach & Co. The quarries are among the largest in the State, but the company has found it impossible to supply the demand for stone this year.

Evan Roberts, foreman of the pit at the granite quarry in Berlin, Wis., was recently killed by a rock which fell upon him, crushing his head and nearly severing it from the body.

The Waupaca (Wis.) Crushed Granite & Stone Company have filed articles of incorporation and elected the following officers: L. Pehl, president; C. R. Carpenter, treasurer; R. Hand, secretary; John O'Laughlin, general manager. The company has begun active operations at its quarry. A railroad spur is being put in and two large stone crushers will be erected. Stripping the rock has already been begun.

The Standard Quarrying Company, which is a consolidation of New England and Canadian Maritime Province quarries, has been formed and opened offices in New York City. The company is capitalized at \$1,000,000 and has been incorporated under the laws of New Jersey. The granite works owned by the company are said to be located at South Thomaston, Pleasant Is'and and Bl'ack Diamond, Me., Free-stone quarries at St. Mary's Point, Sackville and Northport, N. B., and bluestone quarries at Port Jervis, Oakland and Rose Point, N. Y. The officers of this company are Henry C. Blackmar, president; Walter J. Roberts, vice-president and manager; Walter A. Roberts, treasurer, and Charles P. Sumner, secretary.

The Stanstead Granite Quarries Company was recently incorporated at Toronto, with a capital of \$130,000, to operate granite quarries at Stanstead and Mount Johnson, Quebec. The following persons compose the directorate: W. R. Brock, president, Toronto; Hugh Elder, Stanstead Junction; Duncan McIntosh, Toronto; John McIntosh, vice-president, Toronto; John W. Elder, Stanstead Junction; D. Taylor McIntosh, managing director, Stanstead Junction.

The stone quarry recently opened at Momence, Ill., promises to be developed for other purposes than the furnishing of crushed stone. A shaft has been sunk which

reveals a fine quality of building stone and it is believed that at a depth of 15 or 20 feet good dimension stone can be obtained. An equipment will be installed for handling this kind of work.

A boiler at the quarry of the Brier Hill Stone Co., near Youngstown, Ohio, exploded recently but injured no one.

The Illinois Steel Co. is making arrangements to open a stone quarry at Fairmount, Ill., and a railroad spur will be built to the quarry.

Mr. I. S. Stevens has sold his stone quarry at Batavia, Ill., to Messrs. Hunter and Griffith. Mr. Stevens operated the quarry for 31 years.

The Government quarries at La Moille, near Winona, Minn., have closed for the season. Captain Thompson reports the year's work as a fair one, an average of 125 men having been employed. The quarries will be opened again next year.

Pueblo, Colo., capitalists are talking of building a branch railroad to the marble quarries and mines at Beulah and Silver Cliff.

Deep Boring in France.

The Bruay Colliery Company has contracted with the Societe Francaise de Forage, which works under the Raky patents, to put down a borehole, 1,200 m. deep, at Houdain, in the Pas-de-Calais, the first half of the depth being bored with rigid rods and Fauvelle water injection, while for the remainder the diamond drill will be used, so as to permit of bringing up cores, or actual samples, of the rocks passed through. The hole was begun with a diameter of 24 cm.; and in the chalk as much as 50 m. could have been bored daily if the pump had been powerful enough. The Houdain hole, which reached the Devonian at the depth of 280 m., is only proceeding at the rate of 3 or 4 m. daily, the rock being excessively hard.

India's Production of Mica.

During the year 1896 India produced 309 long tons of mica as against 375 tons in 1895, and 180 tons in 1894, 50 per cent. of the output being shipped to the United States. Probably one-half of the mica exported from India to Great Britain finds its ultimate market in the United States. Canada during the same period supplied the United States with about 530,000 pounds of mica annually.

Marble and Granite

William Adams & Sons, the well known monumental dealers of Lexington, Ky., who have an office in Cincinnati as well, report that business since July has been very satisfactory. They have sold considerable medium-sized work. Some time ago the firm put up a fine soldiers' monument at Cincinnati with a granite portrait statue, the work having attracted wide attention. Recently they have put up a handsome spire monument of hammer-dressed white Barre granite in the Lexington cemetery for the Thompson family. This is an unusually graceful design.

W. D. Robbins, a well known monument dealer of Fostoria, O., is dead. He had been long in business and was highly respected throughout Northwestern Ohio.

Messrs. Wiltse, of Jefferson, and M. Pitcher and Charles Marcy, of Conneaut, O., have formed the Western Reserve Monument Company, which will have offices in these two places.

J. L. Zeran has removed his monumental works at Cairo, Ill., to a more convenient location in that place.

Ben F. Lofton, who lives nine miles from Nashville, Tenn., on the old Dickerson Pike, has discovered an excellent quality of marble on his farm. The samples shown are gray, green and pink.

Messrs. G. E. Moir and C. S. Frost have opened a new monumental works at North Derby, Ill., under the name of Moir & Frost.

M. K. Beall, proprietor of the New Carlisle (Mich.) Marble and Granite Works, has opened a branch office at Three Oaks.

Mr. E. R. Tribbles has opened a new marble works at Standish, Mich.

Andrew Carnegie's new residence on Fifth avenue, between Ninetieth and Ninety-first streets, New York, will be built of ornamental granite and brick. It will cost \$500,000.

The ceramic mosaic floors in the Chicago Public Library have been condemned be-

cause of disintegration and will be replaced by marble mosaic. More than 6,000 square feet of flooring is required.

A. C. Gage, of Greenwood, S. C., has accepted the position of superintendent of the Epworth Orphanage marble yard in Columbia.

J. F. Burley & Co., monument dealers of Wheeling, W. Va., is installing compressed air machinery in the works.

J. W. Miller, of the firm of Knox, Miller & Co., marble dealers of Danville, Ill., has sold his interest in the concern and will remove to Indianapolis. Messrs. Knox & Lynch will continue the business.

Mr. R. J. Peters, of Canal Dover, has purchased an interest in the marble shop of Mr. Joseph Beiter, at New Philadelphia, O.

Messrs. A. J. Holdridge, S. W. Holdridge, and T. P. Parker have established a monumental works at Utica, N. Y.

A. W. Smith and T. P. Kingrey, of Kansas City, Mo., have established a monument works at the corner of Walnut street and Second avenue, Dodge City, Kan.

George J. Laundy has moved his Soo Marble and Granite Works, at Sault Ste. Marie, to his new building, at the corner of Portage avenue and Brady street.

The Daniel Boone Marble Works, at Clinton, Ill., has just secured several large contracts for monuments to be erected in Sangamon and Logan counties. The business was established by Messrs. Clark and Boone seven years ago, but Mr. Clark retired about a year ago.

Belden's Falls Marble Company, of Chicago, has been incorporated for the purpose of quarrying, manufacturing and dealing in marble, granite, etc. Capital, \$100,000. Incorporators: Prescott G. Hale, Howard M. Carter and William Gurley.

"Stone workers using shot for abrasive purposes can secure a first class grade of Chilled Steel from Townsend, Townsend & Co., 156 Fifth avenue, New York."—Adv.

The owners of the granite quarries, situated in Burnet County, north of Austin, Tex., know as Granite Mountain, have just closed a contract with the New Orleans & Carrollton Railroad Company for 400 car-loads of crushed granite, to be used for ballast.

The State of Iowa has an option on marble deposits in Jackson county. The marble is yellow in tint and unlike anything else found in the State. The State officials, it is said, contemplate quarrying it with convict labor, using the product in public buildings.

The Davidson Brothers' Marble Company's big plant at the foot of Orlean street, Chicago, was destroyed by fire on November 11, with a loss of nearly \$100,000. This is said to be entirely covered by insurance. The building was a five-story brick structure 180 feet long and 80 feet wide, and the marble works occupied all of the floors except the third, which was used by a maker of soda water fountains. The building was owned by the marble company and was erected in 1881. The Davidson Brothers Marble Co., of which John A. Davidson is president; Alexander Davidson, vice-president, and Joseph Uhrig, secretary, is one of the largest manufacturers of marble interior work in the country.

A Decision As to Duty on Marble.

In the appeal of C. D. Jackson & Co., from the decision of the Collector of Customs at New York, the Board of General Appraisers has rendered the following decision: "Certain limestone of micaceous appearance and not containing angular fragments is held not to be breccia, but to be marble, and to be dutiable at 65c per cubic foot under paragraph 114, act of 1897. The merchandise returned by the appraiser as 'marble blocks,' was assessed for duty at 65c per cubic foot under paragraph 114, act of 1897. It is claimed to be entitled to free admission as 'breccia' under paragraph 508, or as a crude mineral, not specially provided under paragraph 614. It appears from the description of lexicographers and from the evidence of the curator of the Museum of Natural History, who testified in this case, that breccia is an ornamental stone composed of angular fragments produced by fused rock material flowing over and enclosing rubble, or an-

gular fragments of stone. The fragments may be of one or of several kinds and variously colored, but a distinctive feature of breccia is that the fragments are angular. It is used for trimming and decorative work as marble is. The expert referred to testified that the merchandise in question differs from breccia, as the fragments are not angular. He said in part: 'The sample is a block of crystalline limestone, otherwise marble. It is separated by fragments or partings of altered mica, which are shown in the silvery crystalline fragments. It is a metamorphic rock, which has been changed by heat and pressure; it is a characteristic marble.' We find upon the evidence that the merchandise is marble and not breccia. The assessment of duty is affirmed accordingly."

Crushed Granite Insulators.

Crushed granite insulators for electric light purposes may take the place of the glass insulator now in use. Crushed granite is a late invention of a New York man, who has not yet secured a patent upon it. The granite is crushed in a retort with about 3,600 degrees of heat. It is then subjected to an enormous hydraulic pressure and formed into the shape desired. Its particular advantage is that it will stand 200,000 volts, while 1,500 volts will split an ordinary glass insulator. The patentee of the crushed granite means to use it for insulators in underground street railway construction, and also for decorative purposes.

Antiquity of Man and the Stone Age.

Sir John Evans dealt with the antiquity of man, with special reference to the stone age in Egypt, in a presidential address delivered by him at the Birmingham and Midland Institute recently. Assuming the occupation of the earth by man had been continuous, there must at some time or other have been a transition from the palæolithic stage of culture to the neolithic, but of such transition little trustworthy indications had as yet been found, and over a great part of Europe, at all events, there appeared to be "a great gulf fixed," which at present it was impossible to bridge over in a satisfactory manner.

Limestone and Sandstone.

Rumors are current that there is soon to be a consolidation of the stone interests in the Indiana limestone region. This time it is capitalists from Chicago, Detroit, Omaha and St. Louis, who are supposed to be interested in the matter. The quarry properties have been examined by experts.

George Eisenhard has leased the limestone quarry at Alburtis, near Allentown, Pa., and will employ a number of hands in getting out limestone.

There was a strike recently among the quarry force of the Michigan Alkali Company, at Bellevue, Mich. This is one of the largest limestone quarries in the world, containing over three hundred acres and giving employment to over two hundred men. About seven hundred tons of rock are shipped daily to the works at Wyandotte.

The Tennessee Coal & Iron Company has suspended work at the limestone quarry, near Bessemer, Ala. The company had about fifty men employed and were getting out large quantities of stone. As they were already getting stone beyond their needs under contract, from other quarries, they have stopped their own work until these contracts expire.

The Cleveland Stone Company shipped recently from its quarries, at Grindstone City, Huron County, Mich., a carload of stone to Riga, Russia; a quantity of scythe stone to the Netherlands and a consignment of stone to Chili, South America.

The brownstone quarry situated some six miles from Ventura, Cal., has been re-opened, and a large force of men is employed. Large quantities of the stone are to be used by the railroads for rip-rapping purposes.

A new limestone quarry has been opened near Glasgow, Mo., and the stone is being used for the Government work near that town.

Several months ago Messrs. Orr and Long, of Champaign, Ill., purchased a quarry at Riverside, Ind., and are operat-

ing it actively. The quarry produces sandstone of fine quality in blue and buff. The company also supplies crushed stone. The deposit is said to be inexhaustible.

John H. Dwyer has erected a crusher at his new limestone quarry near Delaware, O.

The Fairmont limestone quarry has been purchased by the Chicago Steel Company. The stone is suitable for use in the manufacture of steel.

Mr. A. M. Logan has discovered a valuable deposit of sandstone in Montgomery County, Tenn.

Limestone roads have been built in many parts of Ohio, during the past summer, and the county commissioners report that it is impossible to get the material as fast as it is desired.

The Buena Vista (O.) stone quarries are now running full time.

William Waldorf Astor is to erect a magnificent eight-story fire-proof flat building on Seventh avenue and 116th street, New York, of brick and Indiana limestone, with terra cotta and blue stone trimmings.

The Bloomington (Ind.) "World" says stone land in the Crafton district is advancing. Those who optioned their land a year ago for \$50 per acre are now asking \$100 per acre.

The Monon Company has largely increased its earnings and the officials of the road attribute this to the large volume of traffic from the Bedford district. Bedford stone is growing in popularity and the Government is using it extensively in the new postoffices and other buildings.

The city engineer and board of public works of Duluth recently visited the Minnesota Sandstone Company's quarries to investigate the merits of sandstone for pav-

"Townsend, Townsend & Co., of 156 Fifth avenue, New York, supply a superior grade of Chilled Steel for rubbing, sawing and polishing. Write them for samples and prices."—Adv.

ing purposes. City Engineer McGilvray says: "The standstone paving blocks seem to have the best of the argument. Everywhere they were recommended as superior to other pavements in this climate and suited to our conditions. We visited the quarries at Sandstone and saw many things of interest. Two hundred and fifty men are at work there. The stone they are engaged in taking out is very fine. The paving blocks are made out of chips of the best of the larger stones. One notable thing we saw was an immense derrick. One stick of it is 95 feet long. It is of Washington fir. In Minneapolis we visited City Engineer Sublette. Mr. Sublette favors sandstone for business streets where there is heavy teaming and for steep grades. There is a sample pavement in front of the Union depot, half of sandstone and half of brick, and it seems that the sandstone wears the best. Summit avenue in St. Paul is paved with sandstone, and St. Paul officials favor that stone for streets where there is heavy teaming and for steep grades. It is said that sandstone needs less sprinkling than brick or asphalt for the reason that it absorbs water and holds it better than the other pavements."

Owing to the establishing of the works of the Dominion Iron & Steel Company, at Sydney, Cape Breton, extensive limestone quarries are being opened in that province.

Messrs. Jones & Laughlins, of Pittsburg and J. King McLanaghan, of Hollidaysburg, Pa., have purchased the old Moore farm in Canoe Creek, Blair County, Pa. They will open up extensive limestone quarries. Several hundred men will be employed as the quarries extend for almost two miles along Canoe Creek above Flowing Spring.

The Houghton (Mich.) "Gazette" says: "Although the season for shipping redstone from the quarries at Jacobsville is about over and a number of men have been laid off, there are still employed there about eighty-five men. These are engaged in stripping and getting things in shape for next season's work. The season just closed has been a very busy one and a great deal of stone has been sold. Both the market and the prices were good, and everybody is satisfied. While it is hard to predict what another year may bring, it is

very probable that next season will be another busy one; at least the stone men anticipate it."

Local Officials and High Art.

An amusing story of official fussiness comes from Lesneven, near Quimper. On the 25th ult. a statue of Gen. Le Flô, a local hero, was to be unveiled. The commission for it was given to the Russo-Frank sculptor, M. Godebski, and his work had arrived. But one of the high authorities of the place was not acquainted with sculpture in bronze, and was disappointed when he saw the dull color of the general. The patina was a consequence of a special study by the artist in Pistoja. It was therefore ordered that the surface should be rubbed with emery paper until it acquired the appearance of newness which was considered desirable. The operation, however, was not approved locally, and the feelings of the sculptor, who had adopted the costly "éire perdue" process, can be imagined. On the pedestal was a marble relief. This was considered to lose effect because it was not enclosed within mouldings to form a frame. The local tradesman who was instructed to perform this work erred in his measurements, and in consequence he chipped off a part in order to bring the relief within the compass of the framing. Time may remedy the effects of the scrubbing. The official cannot suffer, but he is never likely to become Minister of Fine Arts.

A Woman's Study of Earth-Waves.

At the final session of the geological section of the British Association, the chief paper was that of Mrs. M. M. Gordon on sigmoidal curves in the earth's crust. This paper was supplementary to the work recently published by Mrs. Gordon in the Quarterly Journal of the Geological Society, and had particular reference to the earth-forms which have been produced by "crust-torsion" in the Alpine mountain system. According to "Nature," in the discussion that followed, the complexity of the subject seemed to daunt most of the speakers, but Prof. Lapworth pointed out how well the results of Mrs. Gordon's field-work agreed with the theoretical deductions to be drawn from the study of inter-crossing earth-waves.

Stone Trade Notes

George C. Hugill, a stone contractor of Akron, O., has petitioned for voluntary bankruptcy, with liabilities of \$11,225.38, and his assets to \$4,334.92.

Soapstone has been discovered in large quantities near Winsted, Conn., and a quarry will probably be opened there this fall.

William C. Stewart, secretary and treasurer of the Forest City Stone Company, of Cleveland, recently married a sister-in-law of Rev. Charles Parkhurst.

The Brenner Cut Stone Company, of Kansas City, Mo., has been incorporated with a capital stock of \$3,500. Incorporators: Charles Brenner, A. C. Brandon, Richard B. Skuse and others.

The Big Four Stone Company, of Greensburg, Ind., reports that it has enough orders for stone to keep the company busy for six months.

It is reported that a company will be formed at Coldwater, Mich., to manufacture rock crushing machines on patents of Mr. F. L. Preston, of Beloit, Wis.

The employees of the Montello (Wis.) granite quarry went on a strike recently but returned to work in a few days.

The Cornwall (Ont.) town council has decided to use no more limestone for road improvements but only hard heads.

The Rucker Stone Company, of West Loveland, O., under the management of Mr. Harry Donnelly, is doing a large business in crushed stone and gravel.

Robert Walker has resumed work at his quarry in St. Peter, Minn.

The Breen Stone Company, of St. Peter, Minn., have purchased a new stone crusher of large capacity. The company has a contract for furnishing a large amount of crushed stone to West Superior.

Justus L. Dwight, a well known stone cutter of Tribes Hill, N. Y., is dead.

Jacob Wittenmeier, one of the proprietors of the Wittenmeier Stone Company, contractors on the new addition to the

statehouse at Columbus, O., was recently crushed to death by a falling stone.

The Warner-Miller Company is the name of a new concern which has succeeded to the business of H. D. Clark & Co., wholesale dealers in masons' building supplies, bluestone, etc., at New Haven, Conn. The business of this concern is large and flourishing, and it carries an immense stock of supplies at all times. The gentlemen who compose the new firm have had wide experience and are held in general esteem.

The Stevens Stone Co., of Chicago, has been incorporated by Albert M. Kitchen, Charles W. Stevens and Fred W. Gezelichap. Capital stock, \$2,400.

C. W. Babcock & Co., St. Peter, Minn., have stopped running their saw mills nights for the present season, owing to the scarcity of stone. So far this year the company has worked over 286 consecutive nights.

A large force of stonemasons have been put to work at Granite Hill quarry, near Augusta, Ga. The workmen are employed by the Quincy Granite Co., of Macon, and it is understood that the job will last for several months.

The Le Clair Stone Co. has delivered the last barge load of stone for the completion of the piers of the new bridge over Rock River.

A Church of Pipestone and Jasper.

A church of unusual construction is now being built at Pipestone, Minn. This is a Presbyterian church planned by Messrs. Pass & Schippel, of Mankato, Minn. The novel feature is that the outside walls will all be built of pipestone and jasper. The village in which the church is situated takes its name from the famous Indian quarries from whence the Indians obtained that peculiar red soapy stone of which they

"For sawing, polishing or rubbing stones of all kinds you can secure a Chilled Steel from Townsend, Townsend & Co., 156 Fifth avenue, New York, which exceeds any material on the market."—Adv.

made their pipes. Pipestone was not alone used for this purpose, for some Indian graves have just been uncovered in the hardest kind of flint, that must have been brought from a long distance.

The Central Park Obelisk.

Every year or two reports are circulated that the obelisk in Central Park, New York, is disintegrating from the effects of severe American winters. When the great monolith was first erected in this country it was predicted by many that its life would be short. Owing to reports recently made as to the condition of the monument, Mr. Julius F. Munckwitz, architect of the New York Park Commission, was directed to examine the obelisk. Mr. Munckwitz recently completed the examination and reported that all statements as to disintegration were absolutely without foundation and that the monument was in just as good condition as it was fourteen years ago.

The Temple of Karnak.

According to Prof. Sayce, the fall of the columns in the great hall of Karnak occurred at 9 a. m., on October 9, and is supposed to have been due to a slight shock of earthquake. Eleven columns in all have fallen in the fourth and fifth rows north of the axis of the temple, and between this and the wall of Seti I. They are thus in a line with the leaning column which was restored last winter by M. Legrain. They all fell in a straight line from east to west, the result being that the westernmost is still partly propped up against the pylon of the temple. The ruin is terrible, and if the hypostyle is to be saved it must be done at once before further mischief takes place. The columns can be set up again, but the architraves above them are utterly broken and destroyed.

M. Legrain, who has been engaged for the last three years in repairing and strengthening the ruins of Karnak, started for Upper Egypt immediately on hearing of the disaster. He found that the columns he had already repaired were uninjured by the fall of their companions; even the famous "leaning column," which he spent last winter in re-erecting, though terribly battered by the huge stones which fell against it, successfully resisted the shock.

It is very unfortunate that the funds at M. Legrain's disposal have not been sufficient to allow him to do more than strengthen and restore the columns whose condition seemed the most critical; those that have fallen did not appear to be in immediate danger, and consequently work upon them was deferred to another year. What has happened has shown that the whole building is in such a critical state that any delay is dangerous, and it is therefore to be hoped that the Egyptian government may see its way towards increasing its grant for the restoration of the temple, and so enable the work of restoration to be fully carried out before a fresh disaster occurs.

Admiral Dewey As a Subject for Sculpture.

Rodin, the famous French sculptor, was recently asked if Admiral Dewey would make a good subject for the sculptor's chisel.

"I have never seen Admiral Dewey," said Rodin, "I have only seen his photographs and descriptions of him. He has a remarkable physique and many physical characteristics. Some men look much like other men, but Dewey seems to be a strong, rugged type, one whose features might well be carved in marble, and, discussing the question from an artistic viewpoint only, from illustrations you have shown to me, I believe he can pose well."

"This is important. Statues and paintings made from photographs instead of from actual sittings never amount to much. Kings rarely sit for their portraits, hence the portraits of crowned heads, even by the best artists, seldom are of much value. Artists paint them from photographs and the best and most striking features are lost. These portraits usually flatter and do to show to the king's friends. If, after death, the paintings are put up at an art sale, they fetch little. The same is true of sculpture."

"There are some clever American sculptors, including Bartlett, Macmonnies, and St. Gaudens. They seem more inclined to the Falquiere school than to mine. I should not think of suggesting that Dewey be sculptured either in plain clothes or a loose wrapper, such as I put around Balzac. An admiral is best where he belongs, namely, in a sailor's uniform, cocked hat and all."

Monumental News

Omaha, Neb., has \$500 on hand as the nucleus of a fund for the erection of a monument to the Douglas County volunteers slain in the Spanish-American war. Judge Brady is chairman of the committee.

Bonham, Tex., has raised several hundred dollars as a beginning toward a Confederate monument at that place.

Maquoketa, Ia., has had the sum of \$500 on hand for several years for a soldiers' monument. The question of the erection of the monument is now being taken up again and it is hoped to get it ready by Decoration Day next year.

St. Joseph, Mo., proposes to raise a fund of \$25,000 for a memorial to William M. Shepard, a public-spirited citizen of that place.

The United Daughters of the Confederacy have decided to assume the responsibility for the erection of a monument to Jefferson Davis at Richmond. The cornerstone of the monument was laid in 1896, in Monroe Park, and the money now on hand amounts to about \$20,000.

Butler County, O., has voted a special tax for three years for the erection of soldiers', sailors' and pioneers' monuments.

Reading, Pa., proposes to erect a soldiers' monument on the top of Mount Penn., 600 feet above the level of the city.

The L. S. Ross Chapter, Daughters of the Confederacy, of Bryan, Tex., have undertaken the task of erecting a monument over the grave of Col. Briscoe G. Baldwin, who died at Bryan last year. Col. Baldwin was a member of Lee's staff.

The Scandinavians of Chicago hope to raise \$6,000 for a monument to Lief Ericson in that city.

An effort will be made to have a suitable monument placed over the grave of ex-President John Tyler in Hollywood, Va. The sum of \$10,000 will be asked from Congress for the purpose.

A monument will be erected in the public square at Knightstown, Ind., in memory of the firemen killed by falling walls in the Masonic Temple.

Norman Eddy Post, G. A. R., of South Bend, Ind., is working for a soldiers' monument at that place.

The five English-speaking Roman Catholic Parishes of Montreal have presented a colossal bronze statue of St. Patrick to Archbishop Bruchesi for the facade of St. James' cathedral.

The grave of the old Indian chief Sleepy Eye has been discovered and it is proposed to remove his remains to Lake Side Park, at Sleepy Eye, Minn., and to erect a monument over his grave.

Petoskey, Mich., proposes to erect a monument to Ignatius Petoskey, the founder of the village.

A monument is to be erected at Antietam to commemorate the dead of the Fifteenth Massachusetts Infantry on that battlefield.

T. H. Pritchard, of the Watertown, S. D., marble works, will erect a soldiers' monument at that place.

The bids for the erection of the Dorchester Heights (Mass.) monument have been opened. All of them, however, exceed the sum appropriated by the Legislature, \$25,000, and nothing can be done until the next Legislature meets.

Phoebe, Va., is raising funds for a monument to Keith Sinclair Curtis, the only soldier from Elizabeth City County who died in the Spanish war.

Spokane, Wash., will erect a monument to Private Shea, of that city, who died in the Philippines.

Marietta, Wis., will erect a soldiers' monument, costing \$2,000 or \$3,000, in the Forest Home Cemetery.

A society has just been formed to be known as the Washington Memorial Association of Alexandria, Va. The purpose in view is the erection of a monument to Gen. George Washington, to commemorate his various civic connections with the

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City of Alexandria. A. J. Wedderburn, the secretary of the association, will secure estimates and designs for the monument. It is proposed that the design shall represent Washington as a farmer, surveyor and a Mason.

A movement has been started in England to erect a fitting monument over the tomb of John Newbury, the first man to collect and publish the immortal melodies of Mother Goose. His grave in St. Thomas' churchyard, Waltham, is falling into ruin.

An act of vandalism was recently committed on groups of statues in Thiergarten, Berlin. The groups were erected on the initiative of the emperor himself. Those which have suffered damage were those of the Margraves. The figures mutilated were not so much the chief of the groups as those surrounding them. Seven of the statues were attacked, the noses and fingers being knocked off, and the objects which were held in their hands have been destroyed, such as shepherds' crooks, documents and rolls of paper.

The Titusville (Pa.) "Herald" says a memorial is to be erected to the memory of Col. Edwin L. Drake, the man who drilled the first oil well. It will be located in Woodlawn cemetery, Titusville; will be of granite, elliptical in form, and will cost about \$20,000. The monument will be the gift of an old friend of Col. Drake, now in the oil business.

The order of Spanish-American War Nurses has asked permission of the Secretary of War to erect a monument in the national cemetery at Arlington to the trained female army nurses already buried in that cemetery, and also to those who may yet die in the service of their country. The monument is to cost not less than \$10,000 and the design is subject to the approval of the Secretary of War. Secretary Root has not yet acted upon the application. In the unexpected event of his refusing to grant the desired permission, it is proposed to place the memorial in Riverside Park, Manhattan.

Money is being raised for a soldiers' monument at Bellefonte, Pa., topped with a statue of Andrew G. Curtin, the old war governor.

A fine Confederate monument has just been dedicated at Parksley, Va. It is made of gray granite, and is the work of Gaddes Bros., of Baltimore. From the

base to the top it is about thirty feet high. At the top is a figure seven feet high, representing a Confederate soldier in uniform, with his rifle in his hand and resting on the ground, as if doing picket duty.

Shelbyville, Ind., is trying to raise \$10,000 for a soldiers' monument.

Alterations and improvements are being made in the interior of the Garfield monument in Lakeview Cemetery, Cleveland, at an estimated cost of \$25,000. Considerable damage has been done by water which percolated through the foundations.

The Cleveland "Plain Dealer" has started a fund to build a monument over the neglected grave of General Moses Cleveland, the founder of the Ohio city, who lies buried in Canterbury, Conn.

Charles H. Hackley will present to the city of Muskegon, Mich., four bronze statues of more than life size of Lincoln, Farragut, Grant, and Sherman, to stand in a park in the center of the city. The first two statues will be executed by Chas. H. Nieuhaus and those of Generals Grant and Sherman by J. Massey Rhind.

Mrs. Clio Hunecker, the Sculptor.

Mrs. Clio Hinton Hunecker, who has just returned to America from Europe after a stay of nearly three years, has earned for herself a reputation as a sculptor that is unique. She has also, by the way, piled up a little fortune by her clever work. Mrs. Hunecker is the modeler of those dainty bronze figures that have of late become the extreme fashion in ornament. Each figure is original and bears the name of the sculptor. Her latest is the figure of a dancing girl, the pose of which is remarkable. Mounted on a pretty pedestal of French marble, these figures readily sell for \$250 each. Mrs. Hunecker, before going abroad, won the prize in a competition of sculptors for a monument to the memory of Gen. John C. Fremont. Her design was accepted by a committee of the Pioneer Association of California, of which John B. Townsend was the chairman. A fund was begun, which it was intended should reach \$10,000, but the death of Mr. Townsend and other members of the committee put a temporary stop to the enterprise. Mrs. Hunecker is now prepared to go on with the work of making the model in clay whenever desired.

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Fine Marble Work in an Old London House.

Disappearing London still exercises a kind of fascination for those who love building and also love their London, says the "Illustrated Carpenter and Builder." It is with regret that so many London landmarks are seen to vanish. A few, however, are restored and repaired. No. 11, Bedford-row, said to be the old town house of the Doughty-Tichborne family, is undergoing considerable repairs. It is an unusually spacious house, even for the thoroughfare, and the walls of all the principal rooms and the walls and ceiling of the chief staircase are completely covered with classical and allegorical oil paintings, after the fashion of the early part of the last century, when the row was built. The mantelpieces are of the purest white marble, and are delicately carved, and have attracted the attention of many connoisseurs. The staircase is of oak, and very elaborate. In early days the row contained many famous inhabitants, and at No. 14 the great surgeon, John Abernethy, once lived.

Rebuilding the Lincoln Monument.

The Lincoln Monument Commission has awarded the contract for rebuilding the monument to the Culver Construction Company, of Springfield, Ill., for \$94,500. The only other bid was from the Schricker-Rodler Company, of Davenport, Ia., whose bid was \$178,600, but which included, besides restoration, the addition of three pieces of statuary—Emancipation, Liberty and Justice.

The work is to be done according to plans prepared by Architect S. A. Bullard,

of Chicago. The whole monument is to be taken down, with the exception of the base, which now rests on bed rock, and the balance of the structure is to be built up from bed rock. Such new material as may be found necessary is to be furnished by the contractor. There is to be an addition of another section of fifteen feet to the shaft, which will make it conform to the original plans, which were departed from in this particular in consequence of lack of funds. All of the first bids received were rejected, as they exceeded the appropriation. The plans were then modified. The work is to be completed by November 1, 1900.

News Wanted of Lewis Roberts, Granite Cutter.

Two or three years ago, a Cornish granite cutter named Lewis Roberts, was working at Butte City Montana. He was a strong, well made man between thirty and forty years of age and an excellent craftsman. If any reader knows of his present whereabouts, or is aware of his death, will they kindly write to his anxious, widowed mother, Mrs. L. Roberts, Church street, Liskeard, England? She will be most grateful, having heard nothing of him for years.

Discovery of a Canaanitish Temple.

The report on the excavations at Tell es-Sâfi, by Dr. Bliss, in the Quarterly Statement for October of the Palestine Exploration Fund, relates the discovery of what is apparently a Canaanitish temple or "high place" with three upright monoliths, probably some of the "pillars" mentioned in the Bible.



The Slate Trade



A company has been organized with a capital of \$25,000 for the purchase and development of a slate quarry at Ether, Montgomery County, N. C.

William Tallman, of Greensboro, N. C., is putting in slate-quarrying machinery.

Henry Parsons has been prospecting for slate north of the Grand Central quarry at Pen Argyl. He believes that he has struck the big Grand Central bed.

The Pen Argyl Valley quarry has just put in a new 50 horse power double drum hoisting machine, made by the Flory Manufacturing Company, of Bangor, Pa.

The Enterprise Slate Company, of Lynnport, Lehigh County, Pa., is so rushed with orders that it is compelled to work eleven hours a day. The company is well equipped and has seven saw beds busy at present. It manufactures about 35,000 register borders a year, and also turns out blackboards, sinks, burial vaults, urinals, etc. The company is one of the largest in the Lehigh section and will be compelled to enlarge its plant shortly.

The leases of William Lobb & Sons and William Harding & Co., on the Albion Slate quarry, will expire the first of the coming year. Next year Messrs. Harding & Co. will work ropes Nos. 2, 6 and 7, and Messrs. Lobb & Sons, ropes Nos. 3, 4 and 5. Rope No. 1 will be idle. Changes will be made in the quarry and a large section of earth has been recently uncovered.

The Crown Slate Co., of Pen Argyl, has taken off a large new piece of top.

Two workmen were killed and one seriously injured a couple of weeks ago by a fall of rock in the quarry at South Poultney, Vt.

The National Slate Co., of Poultney, Vt., has leased its slate quarry to C. W. Perry, John W. Jones, Benjamin R. Jones, John P. Thomas, Richard W. Jones and William Owens, with all its machinery, tools and equipments. The quarry is on the same

vein as the well-known Griffith & Nathaniel quarry.

The American Bangor Slate Company has elected the following directors: M. Pfaelzer, W. J. Turner and R. H. Rushton, of Philadelphia; Conrad Miller, of Nazareth; J. E. Long, of Bangor; Cotton Amy and C. S. Ford, of East Bangor; C. Stroud Colbert and Frank Reeder, of Easton. The directors organized by electing Frank Reeder, president; Conrad Miller, vice-president; J. E. Long, secretary and treasurer; Cotton Amy, general manager. The company's quarry, located about a mile southeast of Pen Argyl, is one of the largest in this section. The monthly production during the past season reached 4,000 squares.

Lehigh and New England capitalists recently gained control of the Bangor Southern quarry. The same parties are said to be negotiating for the Old Delabole quarry opened at Delabole during the past year.

The Consolidated Lehigh Slate Co., at the Empire Slate quarry, Slatedale, Pa., is completing a new factory.

The Hatch Hill Slate Co., of Whitehall, has been incorporated in Albany, N. Y., for the quarrying, manufacture and sale of slate. Capital, \$100,000. Incorporators: Charles H. Sabin and J. McN. Thompson.

In a volume of over 3,300 pages—"Les Ardoisieres des Ardennes"—M. N. Watrin gives an interesting description of the extraction of roofing slate at the extensive quarries at Fumay, Rimogne and Deville-Monthermé in the French Ardennes. These quarries, which have been worked for a long time, afford subsistence to more than 10,000 persons; the production being 140,000,000 slates annually, representing a weight of 55,000 tons, or nearly a quarter of the total French production of roofing slate. The industry began at a very early date. A charter confirming privileges granted to the quarrymen bearing the date

of June 15, 1551, is still preserved, and it is probable that slate was quarried in the Ardennes in the fifth century. The slate is obtained from the base of the Cambrian rocks, and the industry has been successfully developed along the banks of the canalized River Maas. This development illustrates the importance of water transport for heavy and bulky material. The slate is worked by underground mining on an extensive scale. Steam, hydraulic power and compressed air are utilized for winding, pumping and drilling. Electricity is used for blasting and for signals, while telephones ensure rapid communication in the workings. Dynamite is used for driving levels and sinking shafts. The slate is obtained by making excavations, usually 16 m. long, separated by pillars 5 m. thick on each side of the main roadway. The width of these excavations is limited only by the termination of the bed, by unworkable material, or by the boundary of the concession. The height is equal to the thickness of bed workable. The pillars are pierced in places by airways, 4 to 8 m. wide, serving for ventilation, for drainage and for means of access. For blasting down the slate black powder is now but little used. Its place has been taken by compressed powder. The blocks broken down are in some cases of great size. In the Moulin-Sainte-Anne bed they are as much as 20 m. wide, 15 m. long and 1½ m. thick. Large blocks are subdivided with the aid of blasting powder; smaller ones are broken up by wedges. The pieces obtained weigh 50 to 80 kgs., and are carried by the miners to the wagons and brought to the surface.

The Jellico Slate & Iron Company will spend \$1,000,000 in improving their 26,000-acre tract in Monroe County, Tenn. Railroads will be built to aid in developing their slate quarries and iron mines.

Cost of Keeping Up a Great Show Place.

Pembroke's princely dome," which is more generally known as Wilton House, is one of the most interesting mansions in England, says "The Architect and Contract Reporter," of London. Charles I. was more delighted with it than with any of the other English country-houses. The associations of the building are of no less in-

terest. Shakespeare and Massinger were familiar with it, and there Sir Philip Sidney wrote his "Arcadia." The collection of works of art is known to all amateurs. But Wilton entails continual expenditure proportionate to its historic importance. Forty men have to be employed in the Italian gardens and lawns, and the average expenditure yearly on the gardens has been 2,174l., while the repairs to the house amount to 535l. a year. The house is valued at 1,707l. gross. This is not an excessive amount if we consider the interest of the property. But how many people would be ready to accept it on condition of spending about 3,500l. a year in upholding it? The Earl of Pembroke accordingly on Tuesday appealed against the rating. Mr. Squarely, a local valuer, said the letting value of the property was 888l. a year. After hearing the evidence the Court of Quarter Sessions decided to reduce the gross estimated value from 1,707l. to 1,500l., less 15 per cent. The case is interesting, as it suggests the inconvenience which attends the possession of property which has to be conserved in the best possible condition. To some extent Earl Pembroke is acting as a public trustee in preserving a house and grounds of which the reputation is world-wide, but how are local burdens to be borne if such cases are exempted from taxation?

The Grave of John Paul Jones.

Mr. Porter, the United States Ambassador to France, has reported to the State Department that the grave of John Paul Jones has been discovered in Paris. It is said that Secretary Hay will call the attention of Congress to the matter and ask for an appropriation to bring the remains to this country. If there is no mistake in the identification of the grave Congress should not hesitate to take prompt action for reburial in this country and the erection of a fitting monument to the memory of the great sea fighter, who was the first to make the Stars and Stripes respected on the seas, says the Chicago "Tribune." No naval hero has more worthily earned the gratitude of the American people than the lion-hearted sailor who fought the powerful Serapis and its consorts with that rotten old hulk, the Bonhomme Richard, which apparently was no better fitted for a fight than Kipling's old hulk of Bolivar Bay.

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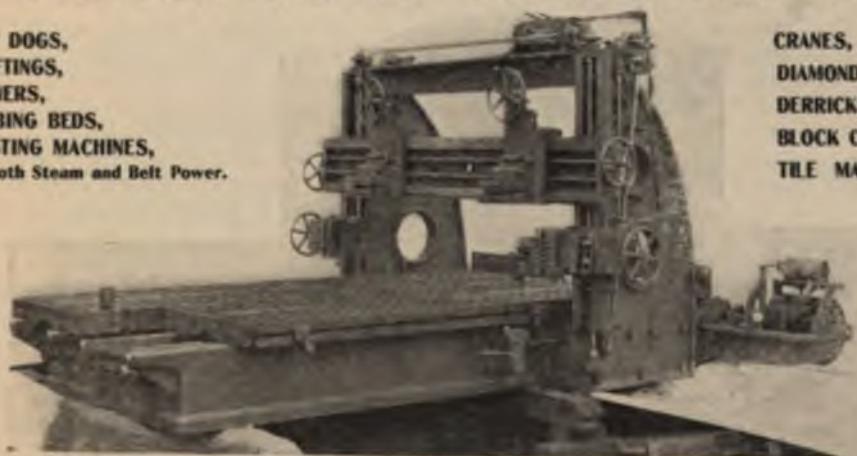
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Limes and Cements



The Legarde Lime & Stone Company, of Anniston, Ala., has put two of its furnaces in operation and is now overhauling its third furnace. When these are all in operation the company will have a capacity of 250 barrels a day.

A much talked of combination of Western lime dealers has been formed at Toledo, with a capital stock of \$3,000,000. The following firms have given options on their plants and are included in the combination: Sugar Ridge Lime Company, Sugar Ridge, O.; Western Lime Company, Huntington, Ind.; Doherty & Co., Toledo, O.; Peabody Lime Company, Luckey, O.; Gottrom Bros., Fremont, O.; S. F. McGrew, Springfield, O.; Delphi Lime Company, Delphi, Ind.; The Clark Company, Clay Center, O.; Charles E. McCain, Delphi, Ind.; Owens & Evans, Owens, O.; D. S. Ervin & Co., Cedarville, O.; Morris & Christian, Marion, O.; the Zorn-Horning Company, Gibsonburg, O.; Morris Lime Company, Springfield, O.; D. S. Irvin Company, Cedarville, O.; D. S. Irvin Company, Yellow Springs, O.; Eddy Lime Company, Luckey, O.; J. W. Jenkins, Durban, O.; Lime City Company, Lime City, O.; Fostoria Sand & Lime Company, Fostoria, O.; Walt & Co., Tiffin, O.; Ingalls Lime Company, Ingalls, Ind.; Leon McCollum, Tiffin, O.; Mills Bros., Springfield, O.; D. P. Lloyd Company, Fostoria, O.; Joseph Kingham, Rocky Ridge, O.; M. E. Gregg, Genoa, O.; James S. Duncan, Williston, O.; Snowflake Lime Company, Bowling Green, O.; Bay Shore Lime Company, Bay Shore, Mich.; Mitchell Lime Company, Mitchell, Ind.; the John Evans Lime & Stone Company, Marion, O.

On account of the recent purchase of the plant of the Ohlemacher Lime Company, the capital stock of the Kelly Island Lime Company has been increased from \$900,000 to \$1,300,000.

A. T. Christmann has sold an interest in his lime kiln at Sugar Ridge, O., to Jacob Urschel.

A valuable deposit of limestone has been opened up by Peter Joyce at the head of Pine Valley, between Pine and Indian Creeks, near San Diego, Cal. A kiln is erected and a large demand for the lime is expected from the cyanide plant at the Stonewall mine, not far from the deposit. The lime is said to be of fine quality.

The cement dealers feel the shortage of cars more than almost any other class of manufacturers, and complaints of lack of shipping facilities come from almost all points in the cement field.

The cement mills of Clark County, Ind., after repeated attempts, have reached an agreement to regulate and maintain prices. No association or combination has been formed and each mill controls its own output and disposes of it.

Edward D. Baker has optioned ninety-three acres of stone land in Bedford from Capt. William Day, for \$4,650. Mr. Baker thinks that an unusually fine Portland cement can be made from the oolitic limestone. Mr. Baker does not reveal his backers in this move, if he has any, but it is surmised that some of the Louisville cement dealers have an interest in the matter.

A. S. Wisner of Marshall, Earl Albertson of Athens, and B. Hamilton of Battle Creek, have formed a stock company with \$220,000 paid in, for the manufacture of cement, one and one-half miles south of Athens, Mich.

The Lawrenceville (N. Y.) Cement Company will erect a number of new buildings for its stone crushing business.

The Cleveland (O.) Cement Company has been incorporated by John A. King, H. B. Wright, R. W. Rodgers and others. Capital, \$10,000.

Calcium Carbide Manufacture.

Norway has so many waterfalls, as well as supplies of chalkstone, that it offers greater inducement as a locality for the manufacture of calcium carbide than most other countries where steam has to be em-

THE
GENESEE VALLEY
BLUE STONE CO.,

Portageville, N. Y.

WILLARD J. EMERSON, President.

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VERDOLITE.

Pronounced by arch-tects the most beautiful decorative stone ever discovered: Combining at once all the wealth and beauty of color of "Royal" Serpentine and "Rose Dolomite." Nature's colors—red and green.

"Victoria" Serpentine.

Distinguished from the "Royal" by erratic tracings of pure white Asbestine. So rare and beautiful that until recently it has been sold by the pound at exorbitant prices.

Tremolite.

Of the purest quality: Pearl white or tinged with delicate shades of pink and green.

Prices and estimates furnished for blocks of any size from one to fifty tons. Write for circular.

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And Dealers in Sawed and Finished
Monumental Work.

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from the recently rediscovered old Quarries near Carystus, Eubœa,
Greece, at the price of modern Swiss.

Farmer & Brindley, London, S. E., England.

Proprietors of Quarries.

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ployed as the motive power. There are now two calcium carbide factories at work in Norway, according to a recent report from the English Consul General at Christiania. The larger of these, of 3,000 horse power, is situated near Hafslund; the other, of 1,500 horse power, near Borregaard, on opposite sides of the Sarpfoss waterfall, above Fredrikstad. The Hafslund factory is shortly to be enlarged to 5,000 horse power. It has been built by the Electricitäts Aktiengesellschaft (formerly Schuckert & Co.), Nürnberg. Other factories are now under consideration.

An Elaborate Monument to an Astronomer.

A monument to the celebrated astronomer, Tisserand, former director of the Observatoire of Paris, has been unveiled at Nuits-Saint-Georges, his native town. The monument, executed by the sculptor, Mathurin Moreau and the architect Vionnois, is an elaborate one, showing on a circular base a pyramid wreathed with laurel and surmounted by a celestial sphere of bronze. On the principal face of the pyramid a bracket supports the bust of Tisserand, on the sides are carved the planetary system and the great telescope of the observatoire which was used by the famous savant, and on the back is cut an inscription giving the titles of Tisserand. A delicately carved frieze representing the signs of the zodiac completes the monument.

Locomotive Cranes for Quarry Service.

The Industrial Works, of Bay City, Mich., have just issued a most attractive illustrated catalogue, devoted to their leading specialty—locomotive cranes, in capacities from three to fifty tons. The company also manufactures electric and hand power jib and traveling cranes, wrecking cranes, pillar and transfer cranes, pile drivers, transfer tables, rail saws, etc. The company is well-known to all readers of this magazine. Many of the cranes made by the concern are specially designed for quarry service and have been used with satisfaction for years in the best equipped quarries in the country. One of these, of large size, is the 25 tons capacity locomotive crane with a long, straight jib, having a maximum

radius of 38 feet, and a minimum of 14 feet. By the use of outriggers, its capacity at an extended radius is increased and its stability secured. Other locomotive cranes of smaller capacity, but still giving a wide radius of action, have special features that fit them particularly for quarry work. The great strength and stability of these cranes are qualities that render them so valuable in handling stone. The car bodies are of steel construction throughout, and all important parts are of steel. The machinery is compact and arranged in the most convenient manner for the operator. The engines are double and fitted with link and reversing motion, and the boilers are of the submerged flue type. It speaks well for the company that some of the largest quarries use several of these cranes in their work.

A New Air Compressor Manufacturing Company.

Announcement is made of the organization of the New York Air Compressor Company under the laws of the State of New Jersey. The capital stock of the company is \$100,000, and a complete foundry and machine shop plant has been purchased on the line of the New York & Greenwood Lake railroad at Arlington, N. J. Contracts have already been let for a full modern equipment of tools. It is intended to manufacture a complete line of air compressing machinery at the new plant. The officers of the company are: J. W. Duntley, president; Alexander MacKay, vice-president; W. P. Pressinger, secretary and treasurer. The directors are: J. W. Duntley, Alexander MacKay, W. P. Pressinger, William B. Albright, W. O. Duntley, Thomas Aldcorn and Austin E. Pressinger. The New York offices of the company are at 120 Liberty street.

William Morris's Grave.

William Morris had a great horror of being buried under a marble slab, and though a costly monument is raised at his grave at Kelmscott, in England, the grass grows green over his remains. The monument is raised high above the grave and there is a space for the grass beneath. There is no long inscription—merely the two words, "William Morris."

THE WARDWELL Steam Stone Channeling AND Quarrying Machine

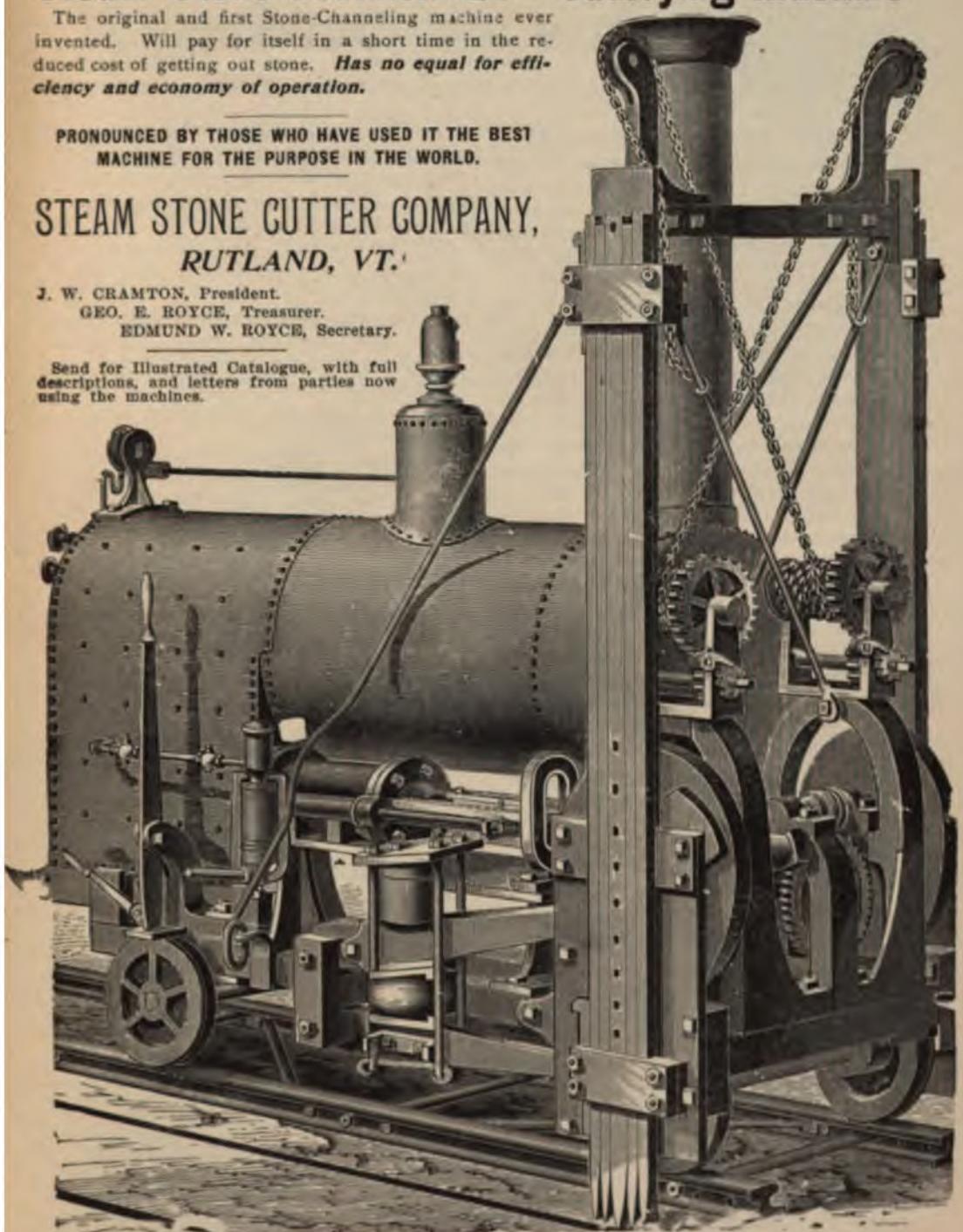
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EDMUND W. ROYCE, Secretary.

Send for Illustrated Catalogue, with full descriptions, and letters from parties now using the machines.



Contracts and Building

Waterworks in Panama.

Consul-General Gudger sends to the State Department from Panama, October 10, 1899, printed translation of an invitation for bids to build an aqueduct and construct an entire waterworks system for that city. The water is to be taken from the drainage area of the River Juan Diaz, and the reservoir is to be situated on Ancon Hill, at least 148 feet above sea level. The supply under every condition must be at least 1,500,000 gallons in twenty-four hours. In addition to the construction of reservoir, dam, aqueducts, distributing system (including fire-hydrants) the constructing company shall agree:

"First. To establish in the city and at places to be selected by the government, four ornamental fountains, whose model is to be approved by the government, the total value not to exceed \$14,000 silver for the whole four.

"Second. To establish four fountains (Borne fontaines) from which poor people or those who not having dwellings stand in absolute need thereof can draw a gratuitous supply of water.

"Third. To establish the required number of meter fountains so as to sell water to persons wishing it, and to ships and small boats anchored at the port.

Tenders for the work will be received at the secretaryship of finance up to 2 p. m. on the 30th of December, and must be accompanied by a deposit of \$5,000.

Government Work.

Alticona, Pa.—\$37,500 has been appropriated for a government building. Plans have not been submitted.

Bristol, Tenn.—Smith & Wilson have the contract for the superstructure of the Government building. Contract price, \$37,500.

New Brighton, Pa.—Press reports state that plans will be prepared for a \$62,500 Government building.

San Francisco.—Bids will be received until December 1 at the Quartermaster's Department, 36 New Montgomery street, San Francisco, for the construction of a stone wall at the Presidio.

St. Augustine, Fla.—For the jetties on St. John's river, 92,000 tons of stone are called for.

Chicago, Ill.—Bids will be received at the United States engineer's office, 1637 Indiana avenue, Chicago, until December 2, for the construction of three miles of feeder, of Illinois and Mississippi canal, near Tampico, Ill.

Washington, D. C.—Initial steps are being taken by the authorities at Washington, towards a brick drill hall at Fort Mead.

Schools, Colleges and Libraries.

Albany, Ga.—Plans have not been prepared for the Carnegie Library to be erected.

Brooklyn, N. Y.—The St. Agnes Catholic Society will build a parochial school at Douglass and Hoyt street. Rev. J. J. Flynn.

Buffalo, N. Y.—Bids are being received for building a sixteen-room schoolhouse at Lovejoy and Gold streets. Estimated cost, \$60,000.

Clarion, Pa.—The citizens of Clarion will accept the offer of Carnegie for erecting a \$50,000 library.

Easton, Pa.—Bolton & Savage, of Philadelphia, will make the plans for a new dormitory building for Lafayette College, at Easton; also, for alterations and additions to the present three buildings, the whole to contain more than 300 rooms.

Edwardsville, Ill.—The Board of Education has decided to build a \$40,000 school. Bonds will be issued.

Findlay, O.—Architect W. L. Kramer, of this city, has been employed by the Mennonite Society to prepare plans for the new college of that church, to be located in Bluffton.

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80 at the Homestake, Lead, South Dakota.
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No. 41.



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Rock Drill used to bore holes in granite columns, State Capitol, Albany, New York.

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Fond du Lac, Wis.—The council has decided to appropriate \$35,000 towards building a school in the Seventh ward.

Gainesville, Fla.—Bids will be received December 1 for building a \$15,000 schoolhouse.

Hackettstown, N. J.—Reports state that the Centenary Institute of the Methodist Church, the buildings of which were destroyed by fire a few weeks ago, will be rebuilt at once. It is stated that the rebuilding will cost about \$300,000.

Hartford, Conn.—Plans have been prepared by John J. Dwyer for the erection of a new building for St. Thomas Preparatory Seminary, to be erected by the Cathedral Corporation, 352 Collins street. Rev. John Synnott, rector.

Joliet, Ill.—F. S. Allen has prepared plans for a new high school building.

Lancaster, Pa.—The trustees of the Millersville Normal School, at a recent meeting, decided to erect a new model school building. A. J. Dempwolf, York, architect.

Newport, R. I.—The City Council will receive a bequest of \$70,000 towards the establishing of an industrial school.

Pontiac, Ill.—A new school will be erected on the South Side. Estimated cost, \$20,000.

Sandusky, O.—Carnegie has donated the Sandusky Library Association \$50,000 for the purpose of building a library.

St. Louis, Mo.—Plans have been submitted for the buildings for the Washington University. It is proposed to expend \$600,000 in the erection of six buildings. It is proposed to commence work in March, and to have them ready for occupancy by September, 1901. W. S. Chaplin, Chancellor.

Bids will be received in December for building a \$100,000 school at Olive and Taylor streets.

Tyrone, Pa.—Andrew Carnegie offers \$50,000 for a library, provided that a site is given and \$3,000 a year to maintain it.

Wooster, O.—The Wooster University will build a \$25,000 library building.

Churches, Convents and Synagogues.

Atchison, Kan.—Plans are being prepared for a \$60,000 convent, to be erected by Sisters of Scholastica.

Atlanta, Ga.—Bruce & Morgan have pre-

pared plans for a handsome stone church for the North Avenue Presbyterian Society.

Baltimore, Md.—B. B. Owen is preparing plans for a \$25,000 church for St. John's Independent M. E. Church.

Chicago, Ill.—Bids are being received for the erection of a church by the Covenant Evangelical Lutheran Church. Charles Thissen, 451 Milwaukee avenue, architect.

Denver, Col.—A site has been purchased at Colfax and Logan avenue, for building a Catholic Cathedral, to cost between \$150,000 and \$200,000. Rev. Michael F. Callahan, rector.

Fairmont, W. Va.—J. E. Allison, of Pittsburg, is making plans for the Fleming Memorial Presbyterian Church, to be built at Fairmont, W. Va. It will cost about \$15,000.

Jacksonville, Fla.—The Newman Street Presbyterian Church will soon begin the erection of a \$15,000 church. Dr. W. Dodge pastor.

Lebanon, Pa.—St. Marks Reformed Church has decided to build a church. Plans will be secured. Rev. I. Calvin Fisher, pastor.

Marshall, Tex.—The Hebrews of this city will let the contract for the erection of a synagogue.

Milwaukee, Wis.—St. Casimir's Polish Catholic Society will erect a \$55,000 church at Clark and Bremen streets.

Minneapolis, Minn.—St. Paul's Episcopal Society has under consideration plans for a new church. Rev. F. T. Webb.

New Castle, Pa.—The English Evangelical Lutheran Society have accepted plans prepared by W. G. Eckles for a \$15,000 church to be erected.

New York.—The Roman Catholic Orphan Asylum will build new four and five story buildings on the east side of Sedgwick avenue, north of 189th street, at a cost of about \$1,000,000.

Pittston, Pa.—The St. Mary's Catholic Society has under consideration plans for a new church. Rev. J. F. Greve, pastor.

Salem, O.—Competitive plans will be received by the board of the trustees for the proposed Presbyterian church.

Santa Rosa, Cal.—Shea & Shea, of San Francisco, have completed the plans for the St. Rosa Catholic Church, to be erected at Santa Rosa. Rev. J. M. Cassin, rector.

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This is the most efficient and economical drill on the market.

The Piston cushions on steam or air. Results:

1. Small breakage of parts, as Piston never strikes back head, spring, or buffer of any kind.
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Spokane, Wash.—The Catholic Society has purchased a site at West Riverside avenue and Madison street for \$25,000 for the erection of a church.

Sault Ste. Marie, Mich.—Charlton, Gilbert & Demar have prepared plans for the \$15,000 church to be erected by St. James Episcopal Society. Rev. Wm. Johnson, rector.

Washington, D. C.—The Sisters of Notre Dame de Namus have purchased a site at North Carolina avenue and First street for the erection of a new home.

County and City Buildings, Hospitals, Etc.

Ada, Minn.—The county commissioners have taken preliminary steps towards building a new courthouse in Ada next year.

Columbus, O.—The West Virginia Mining Association has accepted the plans prepared by Yost & Packard for the proposed hospital. Bids will be received at once.

Emporia, Kan.—The proposition to issue courthouse bonds has been carried.

Hawkinsville, Ga.—Press reports state that the plans prepared by A. J. Bryan & Co., Atlanta, Ga., have been accepted for the jail to be erected in Pulaski county. Estimated cost, \$15,000.

Liberty, Mo.—A movement is on foot to have the county court levy a special tax to build a jail. Estimated cost, \$20,000.

Lockhart, Tex.—The Caldwell county court is considering the erection of a jail.

Mount Holly, N. J.—A new State insane asylum will be built by Burlington county at an estimated cost of \$60,000. Thomas Stephen, Camden, architect. Work will not be begun until spring.

New Martinsville, W. Va.—The plans of W. Chamberlain, of Knoxville, Tenn., have been accepted for the new courthouse here. Builders' bids are asked. The building will be one of the finest of its kind in the State.

New York.—The Commissioner of Public Buildings, Lighting and Supplies is authorized to employ an architect and have plans prepared for an armory for the First Battery at Sixty-sixth street, near Columbus avenue, on ground owned by the city.

Oakland, Cal.—The county board has under consideration plans for a new courthouse.

Savannah, Ga.—Steps are being taken for building a three-story addition to the St. Joseph Hospital. Plans are being prepared by Capt. Henry Blun.

Unionville, Mo.—A village jail will be erected.

Victor, Col.—M. L. McBride, Victor, Col., has prepared plans for the proposed courthouse for Teller county. Estimated cost, \$50,000. Goldfield will give a \$50,000 courthouse provided it is made the county seat.

Business Buildings, Residences, Hotels, Opera Houses, Etc.

Baltimore, Md.—Baldwin & Pennington have plans and specifications prepared for the steel frame bank building for the German Savings Bank. It will be fireproof and have steel vaults. The cost is estimated at \$60,000.

Brooklyn, N. Y.—A new theater will be built by Hyde & Behman Amusement Company, at Broadway, Flushing and Graham avenues.

Buffalo, N. Y.—Bethune & Fuchs are preparing plans for a twelve-story, steel structure hotel, with 300 rooms, to be erected on the site of the old French church, Washington and Clinton streets.

Carthage, Mo.—P. E. Hannum will erect a stone front business building.

Chicago, Ill.—Hyman & Davis, proprietors of the Columbia theater, have arranged for a ninety-nine years' lease for a site on Jackson and Michigan, for the erection of a \$250,000 theater. The theater is to be completed October 1, 1900.

Cleveland, O.—The Tabernacle and Music Hall Association has sold its present property for \$45,000. A new hall will be erected.

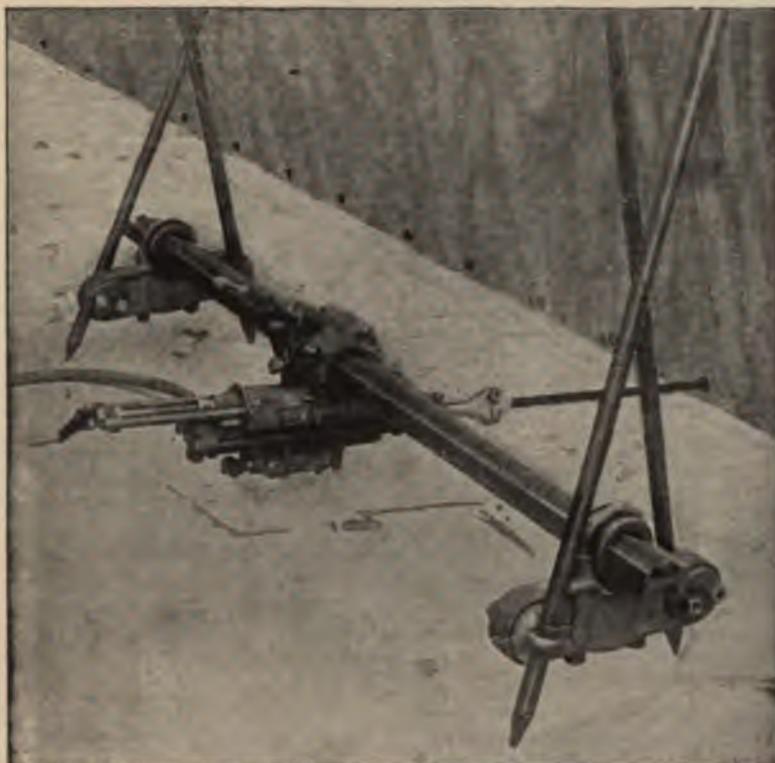
Indianapolis, Ind.—The Victor Rubber Company, which has its headquarters at Springfield, O., has decided to build a large plant at Indianapolis.

Grand Rapids, Mich.—The Columbian Transfer Company will erect a brick and stone block on Monroe street.

Milwaukee, Wis.—The Standard Club is planning to build a \$30,000 clubhouse at Grand avenue, near Twenty-second street. The Fink & Fehrlin Chemical Company will remove from Milwaukee and erect a \$60,000 plant at Cudahy.

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STONE.

Mineola, N. Y.—The plans of Richard H. Hunt for a hospital for the Nassau Hospital Association, have been accepted, and bids are asked for. Estimated cost, \$25,000.

Nashville, Tenn.—The Nashville Chamber of Commerce is taking first steps towards erecting a seven-story building. Estimated cost \$100,000. T. D. Webb, chairman of building committee.

New York.—The Mutual Life Insurance Company will erect two additions to its building, one on Cedar street, costing \$450,000, 12-stories high, and one on Liberty street, costing \$550,000, 15-stories high. They will be steel frame, with facades of granite, limestone, brick and terra cotta. Clinton & Russell, architects.

The Caledonia Fire Insurance Company will build a 12-story office building at 50 and 52 Pine street. James Baker, 156 Fifth avenue, architect.

Leo Wise will erect a business building, with limestone, brick and terra cotta facade, at Fifth avenue and Seventeenth street. Louis Korn, 37 Maiden Lane, architect. Estimated cost, \$350,000.

Paris, Tenn.—A stone opera house will be erected here by Hon. A. B. Lamb and Ben Thompson.

Passaic, N. J.—The Borden Condensed Milk Company will erect a \$50,000 building.

Pittsburg, Pa.—The Pittsburg & Allegheny Telephone Company will erect an exchange building. Ruttan & Russell, architects. Estimated cost, \$20,000.

Portland, Ore.—The Homeopathic Hospital Society will erect a \$20,000 hospital on land donated by Hon. H. W. Corbett.

Salt Lake City.—Architect Neuhausen is at work finishing plans for a magnificent stone residence for Thomas Kearns, which is expected to surpass anything between Denver and San Francisco. The basement walls are now being built of Wasatch granite from the Little Cottonwood. The style of architecture will be pure Italian Renaissance.

Terre Haute, Ind.—The Y. M. C. A. d. a \$300,000 fireproof hotel. Thomas P. building.

Depots and Bridges.

Biggs, Wash.—The Oregon Railway & Navigation Company will build a depot, with all modern conveniences.

Cedar Rapids, Neb.—The Chicago & Northwestern announced plans for building a subway under its tracks on Third avenue, at an estimated cost of \$200,000.

Chicago, Ill.—The Western Indiana Railway Company has accepted the track elevation ordinance, which calls for the abolition of sixty-five grade crossings, the construction of fifty-eight subways, and the elevation of 100 miles of track, at an estimated cost of \$3,500,000.

Cleveland, O.—City Engineer Ritchie is preparing plans for the abolition of grade crossings.

John D. Rockefeller has given the citizens \$225,000 to be expended in the construction of arches under the railroad crossings in the parks and boulevards.

Conneaut, O.—The Lake Shore railway will soon build a new depot.

Denver, Col.—Bids are asked for piers and foundation work for the South Fourteenth street bridge across Cherry Creek.

East St. Louis, Ill.—Plans have been prepared for a new Union depot at East St. Louis.

Fort Dodge, Ia.—The Illinois Central is planning to build a \$40,000 depot.

Gainesville, Tex.—The Gainesville & Gulf railway will build a new depot.

Germantown Junction, Pa.—The Pennsylvania railway will build a new depot at Germantown Junction.

Paducah, Ky.—The engineer's department of the Illinois Central railroad has prepared plans for a passenger station to be built at Paducah, Ky., at a cost of \$50,000.

St. Louis, Mo.—The specifications for the new bridge over Moline Creek call for 4,300 cubic feet of broken stone ballast, 4,000 cubic feet of stone paving, 2,100 cubic feet of rip-rap, 4,600 cubic feet of concrete, and 490 cubic feet of stone masonry.

Utica, N. Y.—The New York Central railway will, at an early date, commence the erection of a depot.

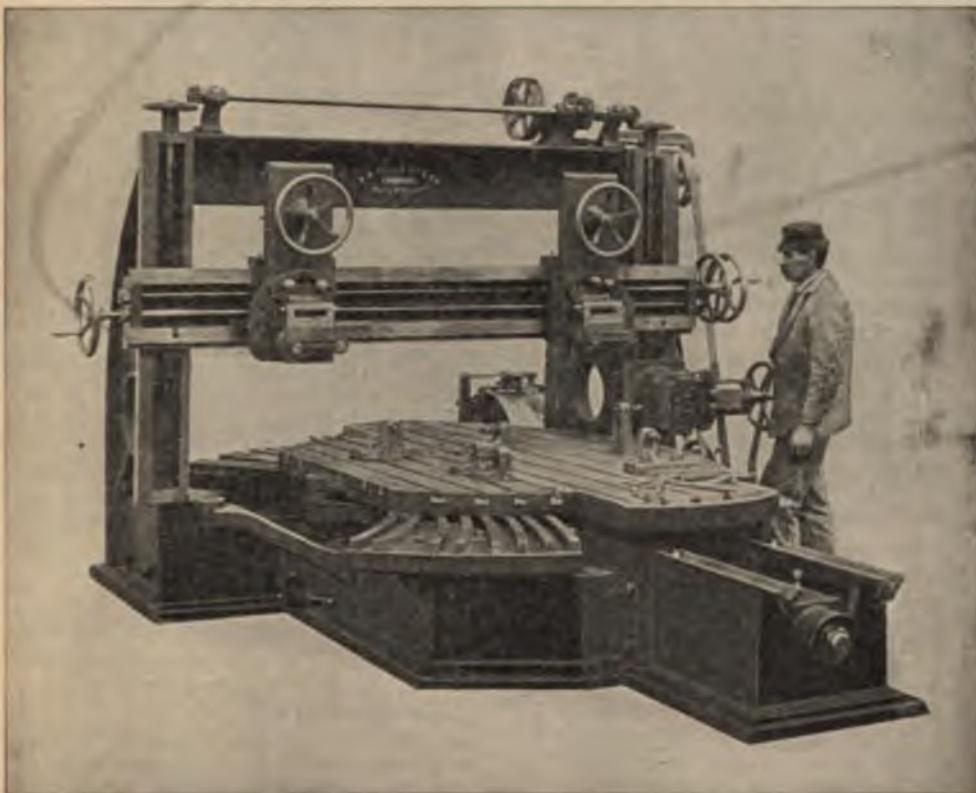
Brick and Clay Working Plants.

Byesville, O.—The Guernsey Brick & Construction Company, incorporated with \$50,000 capital. A plant will be located here, excavation having been commenced. President, J. C. Morton; general manager, George W. Bodine.

Greentown, O.—H. B. Camp has pur-

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Beds, Soft Stone Saws, Jenny Lind
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chased a site here and is preparing to build a large factory for the manufacture of fire-proofing and tile.

Huntsville, Ala.—The Huntsville Brick Company has leased a tract of land in North Huntsville and will put up a plant with a patent steam dry house.

Matthews, Ind.—The Matthews Brick Company incorporated with \$10,000 capital stock. John H. Wood, Willis Moore and others.

Oakland, Md.—T. B. Williams, formerly of the Morgantown (W. Va.) Brick Company, intends establishing a large brick manufactory at this place.

Oklahoma City, O. T.—The Oklahoma Pressed and Paving Brick Company, capital \$20,000. The company has been organized by local capitalists, and will commence work at once.

Pittsburg, Pa.—The Central Brick Company has been incorporated with a capital of \$25,000. Carl Cappel, David J. McGarey.

Sharon, O.—The Sharon Clay Manufacturing Company's plant is being fitted up for the manufacture of brick.

An Old Bridge To Go.

One of the oldest bridges in Europe is soon to disappear under the demand for better navigation of the river it spans. This is the stone bridge, with fifteen arches and a total length of 994 feet, built across the Danube at Ratisbon, by Duke Henry the Superb, in 1135-46. The piers rest on piles protected by stone riprap and heavy ice breakers; the roadway is very narrow and the footways allow the passage of only one person at a time. Hans Sachs, the poet-shoemaker of Nuremburg, sang its praises as one of the wonders of the builders' art and the strongest bridge in Germany. So far as its stability is concerned, it would stand for another 750 years—but it interferes with the passage of steamboats.

Restoration of the Famous "Actors' Church."

St. Leonard's Church, Shoreditch, London, has just undergone a course of restoration and renovation at a cost of 2,100l. St. Leonard's is one of our historical churches. A modest Saxon church was superseded by a Gothic temple after the Conquest, and the present Classic building was erected from the designs of Dance in 1740. It is commonly called

"The Actors' Church," because many of the Shakespearean players were interred there, including Richard Burbage. The crypt was the burial place of the Lovells, the Manners and other noble houses, and contains 5,000 coffins. The building and the clock dials are now lighted by electricity, at the expense of the Vestry. The famous peal of twelve bells, whose chimes arrested the attention of Queen Elizabeth, after having been practically silent for three years, have been put in order, and peals are now rung. The old parish stocks will be removed from the crypt and mounted in the churchyard as a relic of the past.

Effect of Climate on Architecture.

Climatic influences greatly determine the style of a national architecture. To the Sunny South belong the flat roof, the shady colonnade, the horizontal line and frieze, the fountained court, the smaller windows, and the solid tower. To the North the pointed roof that snow and rain shall not decay it, the solid buttress to resist the greater outward pressure of the high and aspiring sloped roof, the perpendicular tendency in design, the larger windows for a less sunny atmosphere; and the pointed spire to carry up the general lines.—Mrs. Leader Scott.

An Absurd Statue of Queen Victoria.

A newspaper correspondent says: There is one part of England with which Queen Victoria and all other members of royalty are disgusted. That place is Guernsey, where the inhabitants are under the ban of extreme disfavor; so much so, in fact, that a statue of the queen which has been awaiting unveiling for months promises never to be exposed to view owing to the queen's refusal of permission.

The statue of her majesty, veiled in waterproof and bound with wires, stands on its pedestal, an object of ridicule, derision and amazement to all passing strangers. For months this statue has been an object of ludicrous hideousness.

No royalty will go to unveil it. A tourist was recently overheard explaining to his little boy that her majesty was so ashamed of her Guernsey people, in consequence of the militia mutiny and the refusal of the money for a new statehouse, that she declined to let them see her face, even in effigy.



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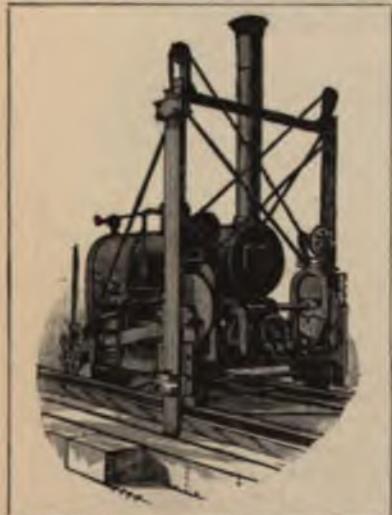
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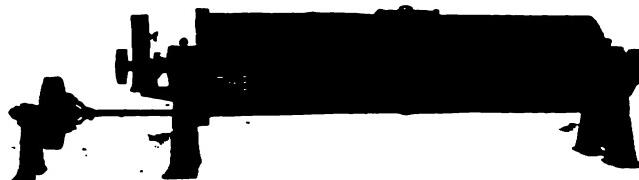
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Trade Notes

Mr. W. E. Bennett, proprietor of the Lanesboro (Pa.) bluestone mills, recently installed one of the Rapid Stone Saw Company's standard gangs. After an investigation, before and subsequent to his purchase, Mr. Bennett wrote to the company, in Philadelphia, as follows: "In making the test of the straight cut gang, just completed for me, we have the following results: One block, 2 feet 3 inches thick, 6 feet 3 inches long, with four blades, 19 5-8 inches in one hour at 96 r. p. m. of the crank shaft. One block 2 feet 2 inches by 10 feet 6 inches, with four blades 15 1-8 inches in one hour at 96 r. p. m. of the crank shaft. After sawing these two blocks, and making the record you agreed. I kept no further account while your sawyer was here. Since he has left my sawyer has made 17 inches in one hour with five blades on a stone 8 feet 6 inches long by 2 feet 4 inches thick at 92 r. p. m. of the crank shaft. We are sawing from 12

the practical test made in my plant and the results that we are getting from the machine daily convince me that it is the proper way to saw stone. I do not hesitate to recommend the machine."

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inches to 16 inches per hour on an average, with from three to five saws in the gang, and doing good straight, smooth sawing almost as smooth as when rubbed. The bluestone I am using is medium hard, as the following will show as compared with other building stones: First is to hardness. Maine granite comes first and our bluestone second. Density—Westchester County, N. Y., marble comes first and the bluestone second; crushing strength is 24,400 pounds to square inch. I have been skeptical as to the results claimed for the Straight Cut Gang until now. I have seen

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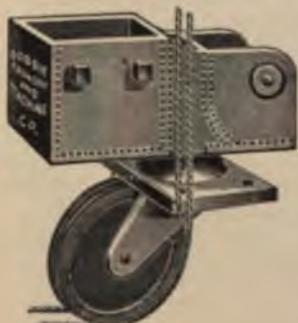
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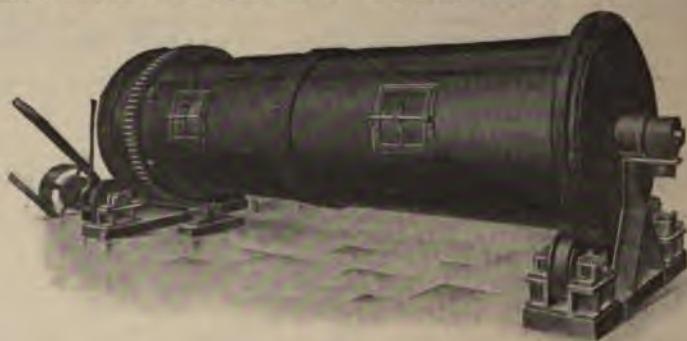
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STONE has already made mention of the Gilmour double platen planing machines, the latest improvement in stone working machinery. The many advantages of this machine commended it at once to progressive stone workers, and it is being placed in many leading shops. The great width of many of the moulded courses in modern buildings necessitates a machine for cutting the stone with plenty of room between uprights. But there are comparatively few of these wide pieces in every job, and many hesitate to purchase a special tool to cut them on account of the disadvantage under which it would have to be used on all ordinary work. This disadvantage, as is well known, consists in

machine. The platens are so constructed that they can be locked together and run as one, or by removing two locking keys they become entirely independent of each other. They are driven by screws and bevel gears, the same as in the ordinary machines, but one screw is made with a right-hand and one with a left-hand thread, and the shipping mechanisms are built to correspond. When this double platen machine is coupled up for wide work the driving gears are locked together by two pinions on the locking shaft. The change from wide single machine to the double machine, or vice versa, can be made in less than three minutes, which shows there is nothing complicated about it.



PEBBLE TUBE MILL OF LARGE CAPACITY.

trying to cut two narrow stones on opposite sides of the same machine and at the same time. Even when the pieces run of uniform length the two workmen will seldom finish at the same time, and this means not only the delay when the stone on one side is finished, but also almost every time a tool has to be changed; then when the stones vary in length from several inches to many feet, the loss to one side or the other of the machine is still greater. The double platen machine does away with all these objections to a wide machine, and combines all the advantages of the wide special planer with those of the smaller, quicker and handier tools, for work within their capacity. The essential feature of this machine consists in placing the beds of two narrow machines side by side and spanning the entire width with one heavy cross-rail, carried on posts of special construction. These beds are properly tied together by heavy cross ribs; each bed is complete and carries all the moving parts of a complete

The shipping mechanism is complete and separate from each side, yet when platens are locked together the shipping rig is also locked, so the machine can be shipped, stopped or started from either side. When used as two machines each side is entirely independent, and they can be run simultaneously on work differing widely in character, without interfering in any way with each other. The double platen planer was invented by Mr. J. Gilmour, who also sells all kinds of stone-working machinery. Mr. Gilmour's address is the Bennett Building, Nassau and Fulton streets, New York.

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Book Reviews.

GEOLOGY OF THE ASPEN MINING DISTRICT, COLORADO, WITH ATLAS. By Josiah Edward Spurr. Samuel Franklin Emmons, Geologist in Charge. Washington, Government Printing Office.

This is monograph No. XXXI. of the United States Geological Survey, and deals with one of the most picturesquely situated mining towns of the Rocky Mountain regions. The great mineral wealth of this section is found in a narrow belt of palaeozoic rocks, which are steeply upturned against the granite and broken in the most complicated manner by a network of faults. The discovery of silver deposits at Aspen were made by prospectors who went there in 1879, men who had been working in Leadville, and who selected the limestone beds of the same horizon as the ore-bearing zone at Leadville, in which to make their investigations. The development of the district was delayed during its early years by its inaccessibility. It could be reached from existing railroads only by crossing the summits of lofty ranges of mountains. Aside from this, the development was retarded by a great amount of litigation, as the natural consequence of the peculiar unfitness of the United States mining laws for giving a clear title, or even any title at all, to deposits of this nature. In the exploitation of its mines and the reduction of its ores, Aspen has shown itself to be unusually enterprising and has led the way in many improvements in either order of mining. Smelting works were built as early as 1882 and extensive lixiviation works were operated in 1891. Electric hoists and electric pumps, aerial wire tramways, and various other modern improvements have been extensively introduced. The fundamental rock in the Aspen district is a granite, with occasional gneissic structure. Above this come successively the sedimentary beds of the Cambrian, Silurian, Devonian, Carboniferous, Juratrias and Cretaceous. The beds of the Cambrian, Silurian and Devonian are comparatively thin, while the Carboniferous, which is divided into three different formations—the Leadville, the Weber and the Maroon—attains a great thickness. The Juratrias and the Cretaceous are also very thick, the latter containing the various subdivisions

of the Dakota, the Colorado, the Montana, and the Laramie. Separating these different beds at intervals are various unconformities and planes of erosion, which help one to read the history of the rock and to understand the conditions under which the beds were laid down. The granite of the region presents a very diversified appearance even over a limited area, but these variations are all, in reality, slight structural modifications of one type, for chemical and microscopic work shows that the rock possesses a remarkable uniformity. The most common variety is moderately coarse, of a general light-green color when fresh, and reddishbrown when weathered.

Mr. Spurr has written a very careful and scholarly monograph that is handsomely illustrated and is accompanied by a large atlas of twenty-seven colored maps and plates.

BULLETINS OF THE PHILADELPHIA COMMERCIAL MUSEUM.

This admirable organization, which is doing a splendid work in developing the foreign commerce of the United States, has begun the publication of little bulletins, of great value to American merchants and manufacturers. "The World's Commerce and the United States' Share of It" is full of suggestive figures that explain the reason for the existence of this museum. The following paragraphs show what field for work there is. "From the standpoint of wealth, the United States ranks first among the nations of the world. Great Britain has 75 per cent., France 60 per cent., and Germany 50 per cent. of the wealth of the United States. In the value of the annual products of its manufacturing industries the United States also ranks first, the value of those of Great Britain being 44 per cent., Germany 35 per cent., and France 30 per cent. of that of the United States. In commerce, although the wealthiest, and also the largest manufacturing nation, the United States ranks third."

"The Republic of Guatemala," by Gustavo Niederlein, Chief of the Scientific Department of the Museum, treats of the topography, climate and resources of Guatemala, based upon observations and studies in 1897 and 1898. On another page will be found what Mr. Niederlein has to say concerning the geological construction and resources of the Republic.

"American Trade with Siam" shows the

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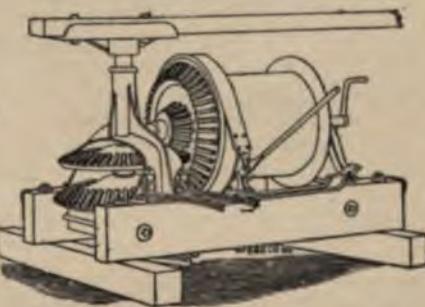
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promising market there is in that kingdom for American manufactures. The work accomplished by the museum is deserving of every commendation and encouragement.

REPORT OF THE SUPERINTENDENT OF THE STATE LAND SURVEY OF THE STATE OF NEW YORK. Verplanck Colvin, Superintendent. Albany: Wynkoop-Hallenbeck-Crawford Company, State Printers.

The importance of the work accomplished by the State Land Survey of New York is evident to anyone who is familiar with the State's holdings of land in the Adirondacks. The scattered condition of the public forest lands gives innumerable opportunities for depredators. The original surveys of New York, made in the colonial period, still remain as the basis and foundation of all land titles in the forest districts. These original surveys were imperfectly made by the first surveyors with crude instruments and with unknown and unrecorded standards of linear measurement. Boundaries were blazed on the bark of trees and during the one and one-quarter centuries that have elapsed since they were first made they have almost entirely disappeared. It was necessary, therefore, to verify and correct the ancient surveys with modern instruments of precision and to locate and erect permanent stone boundaries. Only in this way can the State's vast wealth in forest lands be preserved. Mr. Colvin has made a national reputation for himself by his many years of accurate and painstaking work in the Adirondack survey, and no man living knows this entire region as thoroughly as he. The present report is creditable in every way. It is attractively written, despite the vast amount of strictly technical information that it contains, and is richly illustrated. Last month Stone published an extract from the report on the Garnet deposits in Essex county.

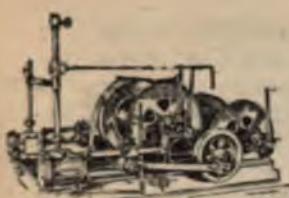
SOME ASPECTS OF EROSION IN RELATION TO THE THEORY OF PENEPLAIN. By W. S. Tangier Smith. Berkeley, Cal.: University of California. Price, 20 cents.

This is one of the admirable bulletins of the Department of Geology of the University of California, issued under the edi-

torship of Andrew C. Lawson. Mr. Smith's paper was called out by a recent article by Prof. R. S. Tarr, who raised a question as to the validity of the theory of peneplains and at the same time proposed a different explanation for the same phenomena under the term beveling. Since Mr. Smith wrote this article a paper has been published by Prof. N. S. Shaler, on the "Spacing of Rivers with Reference to Hypothesis of Base-leveling," in which he reaches conclusions similar to some of those presented here, though by a different line of reasoning. Mr. Smith adduces most of his arguments from a close study of the Pacific Coast Range, largely in San Clemente Island. Brief as the article is, for it covers only twenty pages, it is a careful and scholarly work.

A PRIMER OF FORESTRY, PART I.—THE FOREST. By Gifford Pinchot. Washington: The Government Printing Office.

This most attractive little volume forms Bulletin No. 24 of the United States Department of Agriculture, Division of Forestry. The present part deals with the units which compose the forest, with its character as an organic whole, and with its enemies. It may be said to sketch the foundation of the practice of forestry and of forest policy. Part II., which is to follow, will be entitled "Practical Forestry," and will deal with the practice of forestry, with work in the woods, with the relation of the forest to the weather and the streams, and will conclude with a brief description of forestry at home and abroad. Forestry is one branch of governmental economy that was long shamefully neglected in this country. Our magnificent forests, unsurpassed by those of any other land, were left almost wholly to the mercy of the lumberman, and if they escaped his ax they fell by fire. Not only was nothing done in the way of reforesting, but little was accomplished in the way of restricting the destruction of the forests. Although much still remains to be done in the way of systematic forestry, an excellent beginning has been made. A great deal of credit for the awakening of public interest in the subject is due to Mr. Pinchot, whose work as a private forester under the generous direction of Mr. Geo.



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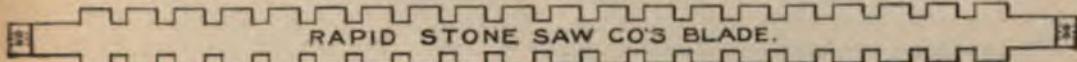


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W. Vanderbilt, at Biltmore, N. C., brought him wide repute. The present volume will help along the good work to a marked degree, as it is one of the most interesting of Government publications. It is a beautiful little book of less than 100 pages, but containing 130 rarely attractive illustrations. It is written in a simple direct and forcible style. We can think of no higher praise for it than to say that we should like to see it used as the text book in high schools all over the land.

Curious Interments.

In olden days, observes the Rev. J. E. Vaux, F. S. A., bodies were sometimes buried in an erect position. Thus, in the north transept of Stanton Harcourt Church, Oxfordshire, the Harcourt family are buried. Tradition relates that Sir John Harcourt, who died in 1330, was buried here in a standing posture. In the pavement above is a circular stone, in which is inlaid a shield of brass bearing the family arms.

At the close of the last century one Job Oxton, an innkeeper, left instructions that he should be buried in an erect posture, and it is said that his wish was complied with. The man's motive was the hope that he would rise before his wife, who was interred in the ordinary fashion.

Ben Jonson was thus buried at Westminster Abbey, the supposition being that this was to avoid the large fee demanded for a full-sized grave. For a long time it was supposed that this story was invented in order to account for the smallness of the gravestone. The grave, however, was opened some fifty years ago, and the dramatist's remains were discovered in the attitude indicated by the tradition.

In the first canto of the "White Doe of Rylston" Wordsworth refers to erect burials thus:

"Pass, pass, who will yon chantry door,
And through the chink in the fractured
floor

Look down, and see a grisly sight,
A vault where the bodies are buried up-
right;

There face to face, and hand to hand,
The Claphams and Mauleverers stand."

This relates to a tradition respecting the vault of the Claphams at the east end of the north aisle in Bolton Priory Church.

Monument to Two Armies.

The Maryland monument, dedicated on the field of Antietam on October 25, is a new departure in the way of battle monuments, reports the Baltimore "Sun." It is erected by the State to the memory of Maryland soldiers who fell upon that bloody field on September 17, thirty-seven years ago. Some of those gallant Marylanders were fighting for the Union and some of them were fighting for the Confederacy. They were equally brave, they were equally patriotic, for they fell fighting for what they believed was right, and they were all sons of Maryland. It is meet and right, therefore, that they should receive equal honor from those who have come after them and from the State which is mother of them all. The money to build this monument was appropriated by the Legislature at the last session, and the commission selected by the Governor included Confederates and Union men. The commission asked the Governor to "make the dedication of this monument an important occasion in the history of the State, as it was a novel one to all the people of the Union.

The location of the battlefield is one of the most fertile and beautiful portions of the State. The appearance of the field has been much changed by cutting down some of the woods, but marks of the great battle still remain. On one of the most prominent hills overlooking the field, and near where Gen. Lee stood directing his army, there is a national cemetery where the Union troops who fell lie buried. In this cemetery there is a colossal statue in granite of a private soldier—a magnificent piece of art—which was an exhibition at the Centennial Exposition in 1876. Surmounting the keeper's lodge is a tower from which a fine view of the whole field may be had.

While the Antietam field is far behind that of Gettysburg in the attention which it has received, yet much has been done there. Many States whose soldiers took part in the battle have erected monuments to record their valor and to mark their place on the field. Some excellent roads have been made, and iron plates properly lettered mark the positions of the various regiments and divisions, as well as those places which have any special interest.

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FOR SALE.—A good Blue Stone Quarry, thirty-seven acres, located at Summit, N. Y.; price, \$800, cash; also one double-head planer made by Millard. Bed 16x8, price, \$1,000. Two gang saws, \$250 each. Particulars, address T. H. MAGILL, Troy, N. Y.

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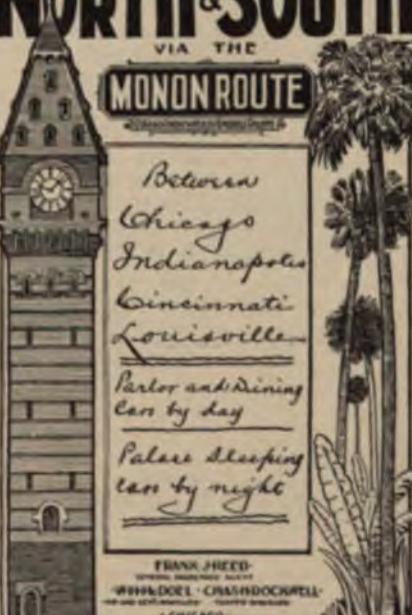
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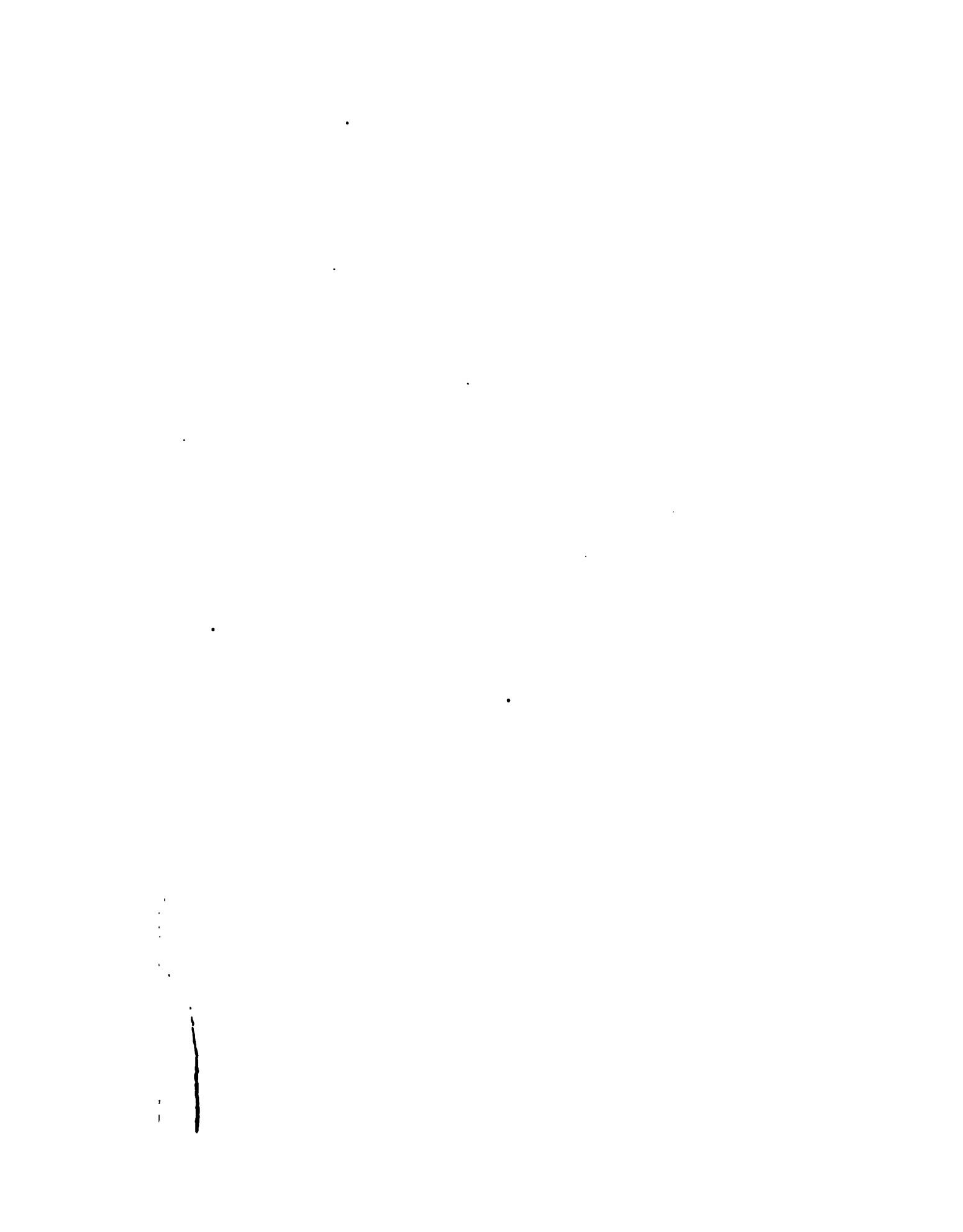
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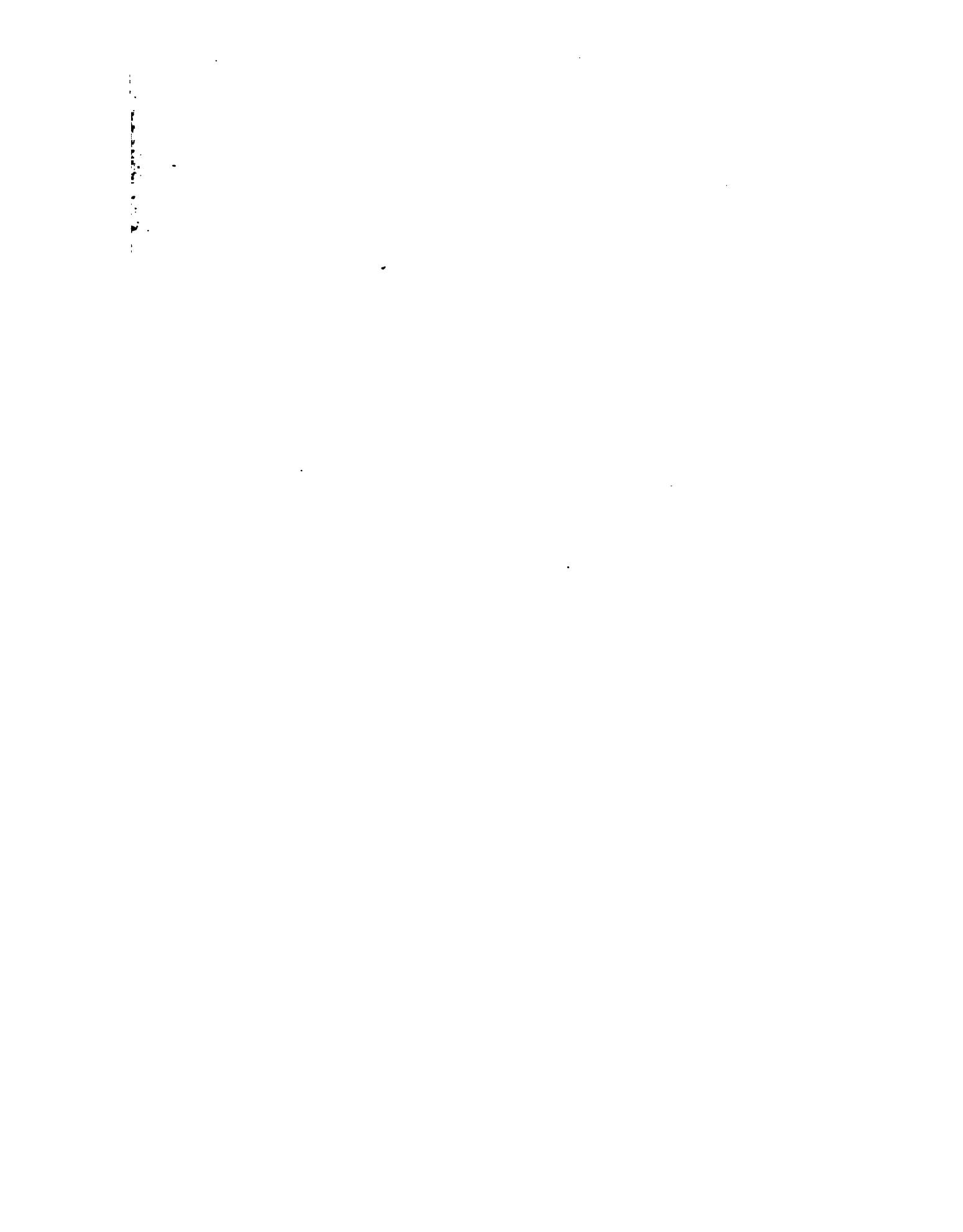
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